GROUP 35B

ANTI-SKID BRAKING SYSTEM (ABS)

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GENERAL INFORMATION

M1352000100636

FEATURES

The 4ABS ensures directional stability and controllability during hard braking.
For vehicles with this type of ABS, 4 sensors (4 channels) are installed on front and rear wheels allowing independent left and right control.
The system has the following features:

- EBD (Electronic Brake-force Distribution system) control has been added to provide the ideal braking force for the rear wheels.
- Magnetic encoder for detecting wheel speed has been installed as a wheel speed sensor instead of the rotor.
- For wiring harness saving and secure data communication, CAN* bus has been adopted as a tool of communication with another ECU.

*NOTE: *For more information about CAN (Controller Area Network), refer to GROUP 54D, General Information P.54D-2.*

EBD CONTROL

In ABS, electronic control is used so the rear wheel brake hydraulic pressure during braking is regulated by rear wheel control solenoid valves in accordance with the vehicle's rate of deceleration, and the front and rear wheel slippage which are calculated from the signals received from the various Wheel speed sensors. EBD control is a control system which provides a high level of control for both vehicle braking force and vehicle stability. The system has the following features:

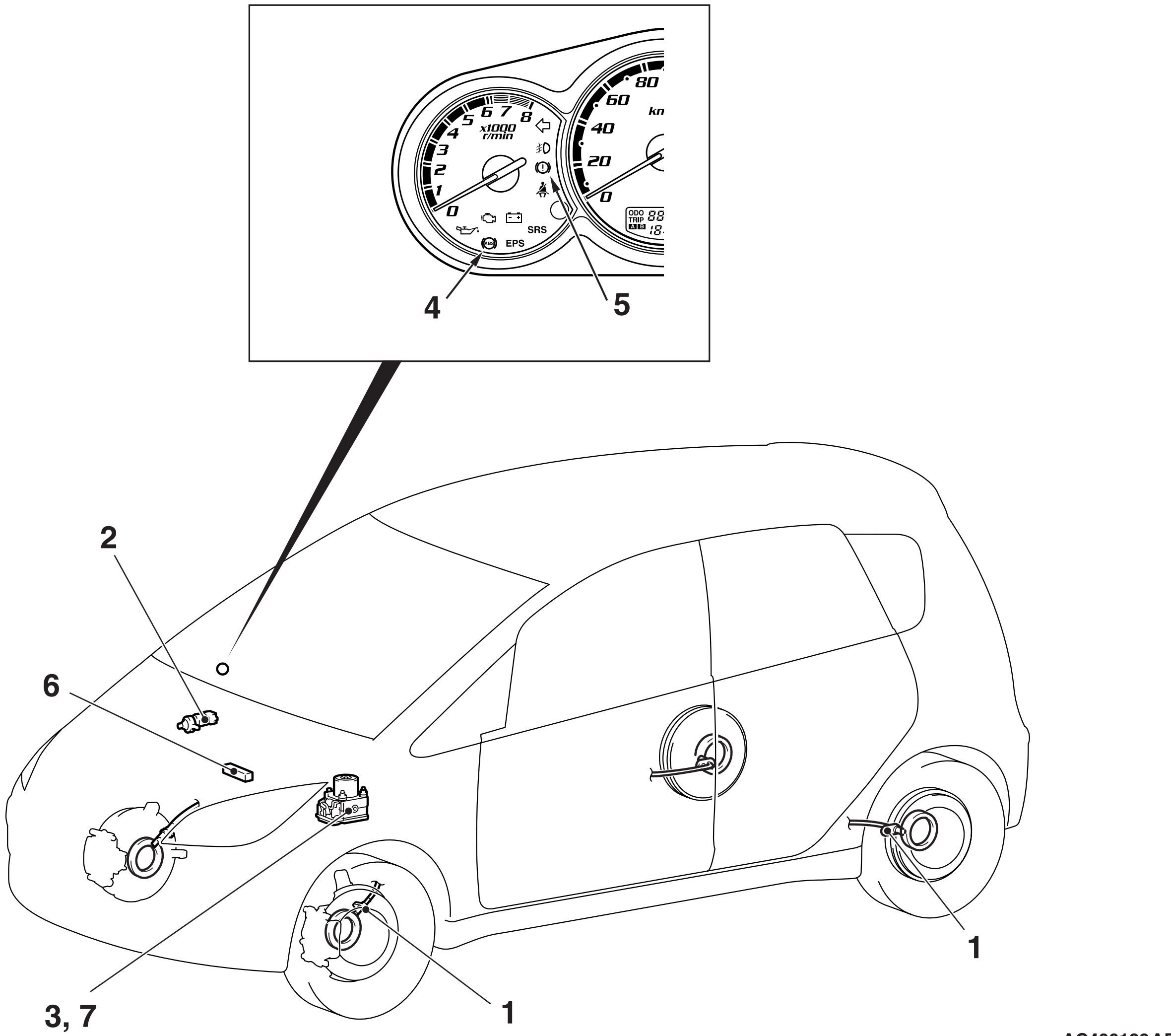
- Because the system provides the optimum rear wheel braking force regardless of vehicle load conditions and the condition of the road surface, the system reduces the required pedal depression force, particularly when the vehicle is heavily loaded or driven on road surfaces with high frictional coefficients.
- Because the duty placed on the front brakes is reduced, the increases in pad temperature can be controlled during brakes application to improve the wear resistance characteristics of the pad.
- Control valves such as the proportioning valve are no required.

SPECIFICATIONS

Item			Specification
ABS control method			4-sensor, 4-channel
Wheel speed sensor	Magnetic encoder	Front	86 (N pole:43, S pole:43)
		Rear	86 (N pole:43, S pole:43)
	Type		Semiconductor

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CONSTRUCTION DIAGRAM



Name of part		Number	Outline of function
Sensor	Wheel speed sensor	1	Sends alternating current signals at frequencies which are proportional to the rotation speeds of each wheel to the ABS-ECU.
	Stop lamp switch	2	Sends a signal to the ABS-ECU to indicate whether the brake pedal is depressed or and pump motor.
Actuator	Hydraulic unit	3	Drives the solenoid valves and pump motor according to signals from the ABS-ECU in order to control the brake hydraulic pressure for each wheel.
	ABS warning lamp	4	Illuminates in response to signals from the ABS-ECU when a problem develops in the system.
	Brake warning lamp	5	Illuminates in response to signals from the ABS-ECU when a problem develops in the EBD system or the brake fluid level is low.
Diagnosis connector		6	Outputs the diagnosis codes and allows communication with the M.U.T.-III.

Name of part	Number	Outline of function
ABS-ECU	7	Controls actuators (described above) based on the signals coming from each sensor.
		Controls the self-diagnosis and fail-safe functions.
		Controls the diagnostic function (M.U.T.-III compatible).

SERVICE SPECIFICATIONS

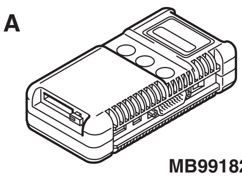
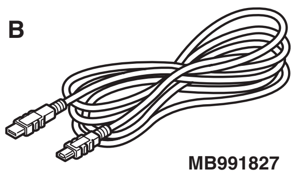
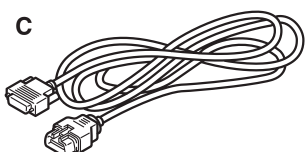
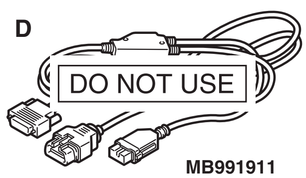
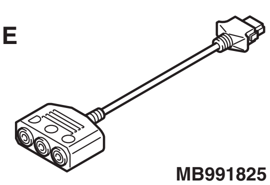
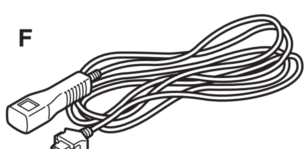
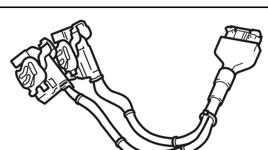
M1352000300715

Item	Standard value
Current applied to the wheel speed sensor (mA)	5.9 – 8.4
Insulation resistance of the wheel speed sensor (MΩ)	5 – 100

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SPECIAL TOOLS

M1352000600846

Tool	Number	Name	Use
A  MB991824 B  MB991827 C  MB991910 D  MB991911 E  MB991825 F  MB991826 MB991955	MB991955 A: MB991824 B: MB991827 C: MB991910 D: MB991911 E: MB991825 F: MB991826	M.U.T.-III sub-assembly A: Vehicle Communication Interface (V.C.I.) B: M.U.T.-III USB cable C: M.U.T.-III main harness A (Vehicles with CAN communication system) D: M.U.T.-III main harness B (Vehicles without CAN communication system) E: M.U.T.-III measure adapter F: M.U.T.-III trigger harness	CAN bus diagnosis ⚠ CAUTION **For vehicles with CAN communication, use M.U.T.-III main harness A to send simulated vehicle speed. If you connect M.U.T.-III main harness B instead, the CAN communication does not function correctly.**
 MB991951	MB991951	ABS check harness	Checking continuity and measuring voltage at ABS-ECU harness-side connector

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TROUBLESHOOTING

STANDARD FLOW OF DIAGNOSTIC TROUBLESHOOTING

M1352011100696

Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – Contents of Troubleshooting P.00-5.

NOTES WITH REGARD TO DIAGNOSIS

M1352012600230

1. The ABS is a system which controls the brake pressure by means of the operation of the ECU. Accordingly, the following symptoms may occur at times, but these are a sign of normal ABS operation, and do not indicate a malfunction.

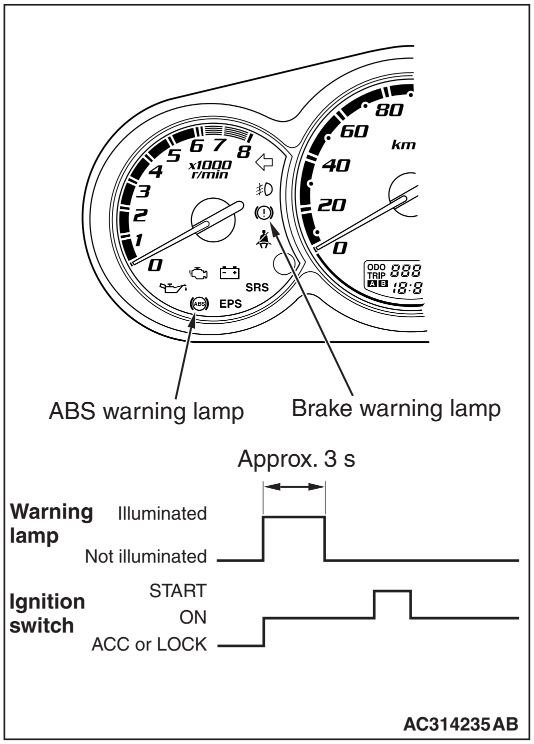
Phenomenon	Explanation of phenomenon
• Sounds come when the brake pedal is depressed gradually. • When the ABS is operated, sounds come out of the chassis component because of repeating the controlled and non controlled states. • After the ABS is operated (immediately after the vehicle is parked), sounds come when the brake pedal is depressed gradually. • After parking the vehicle with EBD operation, sounds come when the vehicle starts firstly.	This is the sound of normal system operation, and is not a malfunction.
• Shocks are felt if the brake pedal is depressed when driving at low speed. • Slight noise appears from the engine compartment.	This is due to system operation checking (starting-of check when the vehicle speed reaches a certain number of km/h) and is not a malfunction.

2. For road surfaces such as snow-covered roads and gravel roads, the braking distance for vehicles with ABS can sometimes be longer than that for other vehicles. Accordingly, advise the customer to drive safely on such roads by lowering the vehicle speed and not being too overconfident.
3. Diagnosis detection condition can vary depending on the diagnosis code. Make sure that checking requirements listed in the "Comment" are satisfied when checking the trouble symptom again.

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ABS AND BRAKE WARNING LAMP INSPECTION

M1352012000272



Check that the ABS and brake warning lamp illuminates as follows.

NOTE: The brake warning lamp is used as EBD warning lamp.

1. When the ignition switch is turned to the "ON" position, the ABS and brake warning lamp illuminates for approximately 3 seconds* and then switches off.

   *NOTE: *: ABS warning lamp may stay ON until the vehicle speed reaches a few km/h. As far as the ABS-ECU stores any diagnosis code related to the wheel speed sensor malfunction or the motor malfunction as past trouble, the ABS-ECU continues illuminating ABS warning lamp until it verifies that the malfunction for that code is resolved (Startup check).*

2. If the illumination is other than the above, check the diagnosis codes.

DIAGNOSIS FUNCTION

M1352011200853

READING DIAGNOSIS CODES

Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – Diagnosis Function P.00-7.

ERASING DIAGNOSIS CODES

Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – Diagnosis Function P.00-7.

INSPECTION CHART FOR DIAGNOSIS CODE

M1352011300850

Follow the inspection chart that is appropriate for the diagnosis code.

⚠ CAUTION

During diagnosis, a diagnosis code associated with other system may be set when the ignition switch is turned on with connector(s) disconnected. After the troubleshooting has been completed, check whether a diagnosis code is set. If a diagnosis code is set, erase it.

Diagnosis code No.	Inspection item	Diagnostic content	Reference page
C1200	Wheel speed sensor (FR) system (open circuit, short to earth or power supply)		P.35B-9
C1201	Wheel speed sensor (FR) system (sensor output failure)		P.35B-13
C1205	Wheel speed sensor (FL) system (open circuit, short to earth or power supply)		P.35B-15
C1206	Wheel speed sensor (FL) system (sensor output failure)		P.35B-19
C1210	Wheel speed sensor (RR) system (open circuit, short to earth or power supply)		P.35B-21
C1211	Wheel speed sensor (RR) system (sensor output failure)		P.35B-25
C1215	Wheel speed sensor (RL) system (open circuit, short to earth or power supply)		P.35B-27
C1216	Wheel speed sensor (RL) system (sensor output failure)		P.35B-31

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Diagnosis code No.	Inspection item	Diagnostic content	Reference page
C1225*	Wheel speed sensor system (sensor output failure)	Stores the diagnosis code if the ABS control continues for one minutes or more, or the failed wheel is not identified.	–
C1226	Control solenoid valve (FR) pressure holding system		Replace the hydraulic unit (Integrated with ABS-ECU) (Refer to P.35B-78).
C1231	Control solenoid valve (FR) decompressing system		
C1236	Control solenoid valve (FL) pressure holding system		
C1241	Control solenoid valve (FL) pressure reducing system		
C1246	Control solenoid valve (RR) pressure holding system		
C1251	Control solenoid valve (RR) pressure reducing system		
C1256	Control solenoid valve (RL) pressure holding system		
C1261	Control solenoid valve (RL) decompressing system		
C1266	Motor system (stuck)		P.35B-33
C1273	Motor relay stuck off		P.35B-38
C1274	Motor relay stuck on		P.35B-41
C1276	Valve relay system		P.35B-44
C1278	Valve relay system stuck off		P.35B-46
C1279	Valve relay system stuck on		Replace the hydraulic unit (Integrated with ABS-ECU) (Refer to P.35B-78).
C1607	Trouble in ABS-ECU		Replace the hydraulic unit (Integrated with ABS-ECU) (Refer to P.35B-78).
C1860	ABS-ECU power supply system (abnormal voltage increase) (16.8 ± 1.0 V or more)		P.35B-49
C1861	ABS-ECU power supply system (abnormal voltage drop) (9.6 ± 0.3 V or more: ABS prohibit, 7.6 ± 0.3 V or less: ABS and EBD prohibit)		P.35B-50
U1073	Trouble in CAN bus system		P.35B-55

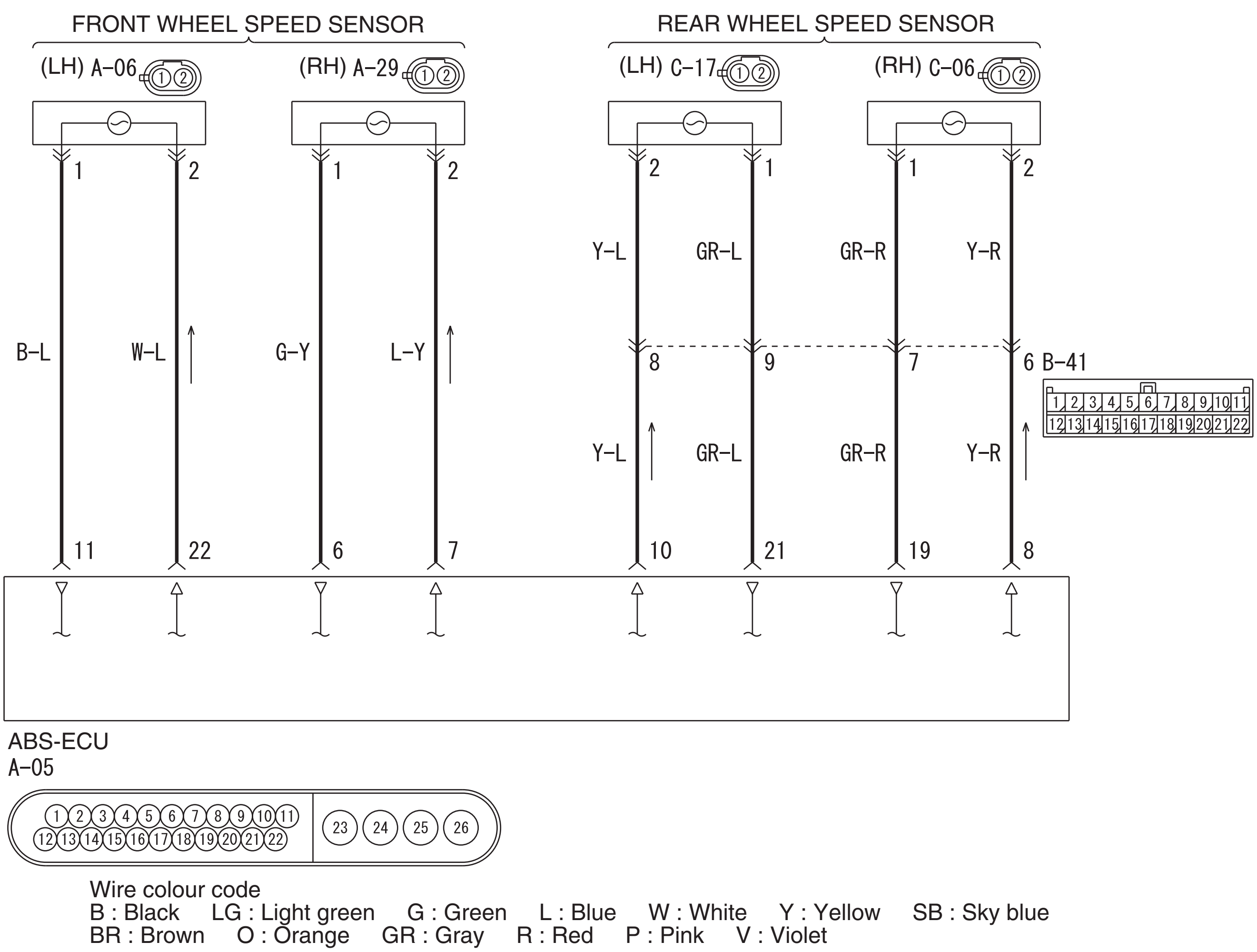
*NOTE: *: This diagnosis code may be set if the wheels spin or slip for a certain period (10 seconds ore more). Verify the customer whether he/she encountered such a driving condition. If yes, erase the diagnosis code and complete the diagnosis process. If no, there may be electrical noise in the wheel speed sensor line. For each of the wheel speed sensors, carry out troubleshooting (diagnosis code; C1201, C1206, C1211 and C1216).*

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DIAGNOSIS TROUBLE CODE PROCEDURES

Code No.C1200: Wheel speed sensor (FR) system (open circuit, short to earth or power supply)

Wheel Speed Sensor Circuit



W3N35X005A

OPERATION

The wheel speed sensor is a pulse generator. It consists of encoder (a plate on which north and south pole sides of the magnets are arranged alternately) for detecting wheel speed which rotates at the same speed as the road wheels. This sensor sends frequency pulse signals in proportion to wheel speed. The pulse signals, which the wheel speed sensor creates, are sent to the ABS-ECU. The ABS-ECU uses the frequency of the pulse signals to determine the wheel speed.

DIAGNOSIS CODE SET CONDITIONS

The ABS-ECU monitors the voltage change in each of the wheel speed sensor circuits. If the ECU detects an open or short circuit in any of the circuits, the ECU sets the diagnosis code.

PROBABLE CAUSES

- Damaged wiring harness or connector
- Malfunction of the wheel speed sensor
- Malfunction of the hydraulic unit (integrated with ABS-ECU)

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DIAGNOSIS PROCEDURE

STEP 1. Remove the front right wheel speed sensor and check it.

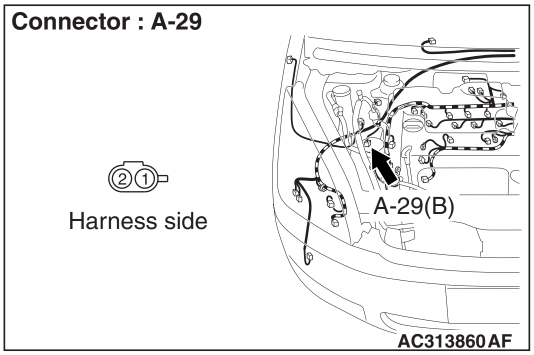
Refer to P.35B-81.

Q: Is the check result normal?

YES : Go to Step 2.

NO : Replace the front right wheel speed sensor (Refer to P.35B-80).

STEP 2. Check the front right wheel speed sensor connector A-29.



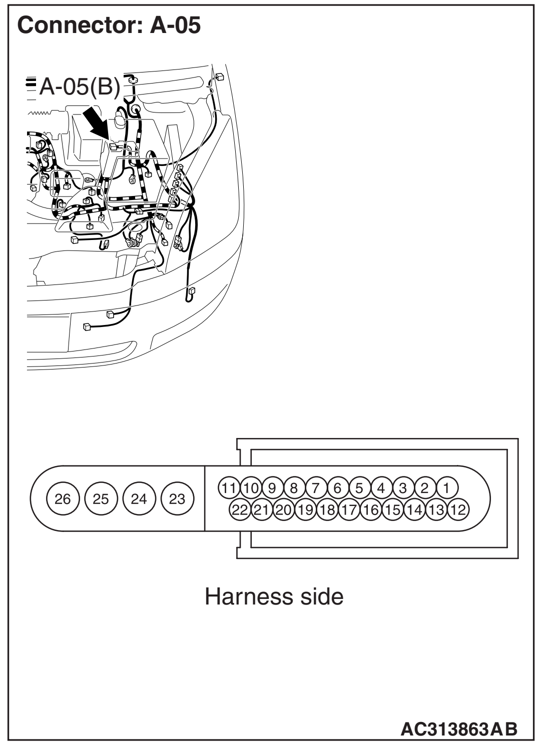
Check the connectors, for loose, corroded or damaged terminals, or terminals pushed back in the connector.

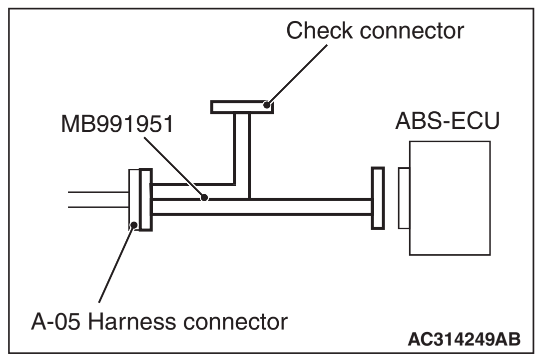
Q: Is the check result normal?

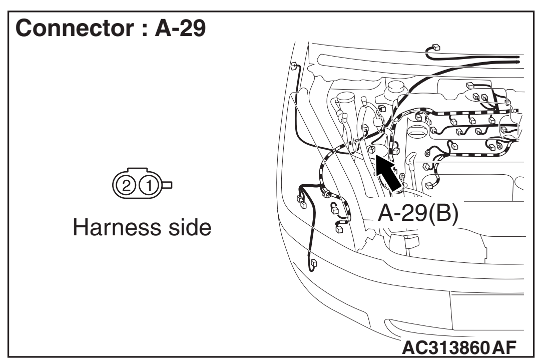
YES : Go to Step 3.

NO : Repair or replace the damaged component(s). Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – Connector Inspection Service Points P.00-11.

STEP 3. Check the continuity (short to earth) at ABS-ECU connector A-05.



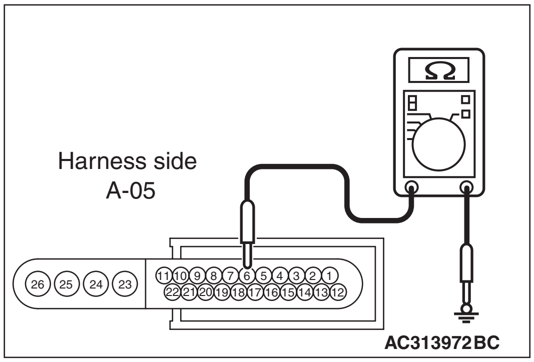




(1) Disconnect the front right wheel speed sensor connector A-29 and ABS-ECU connector A-05, and connect special tool ABS Check Harness (MB991951) to the wiring harness-side connector.

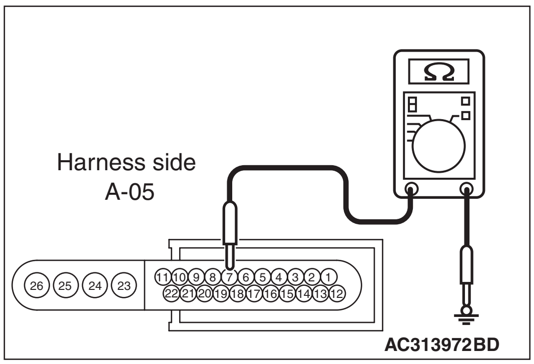
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NOTE: Do not connect special tool ABS Check Harness (MB991951) to the ABS-ECU.



(2) Continuity between ABS-ECU connector A-05 terminal 6 and body earth

OK: No continuity



(3) Continuity between ABS-ECU connector A-05 terminal 7 and body earth

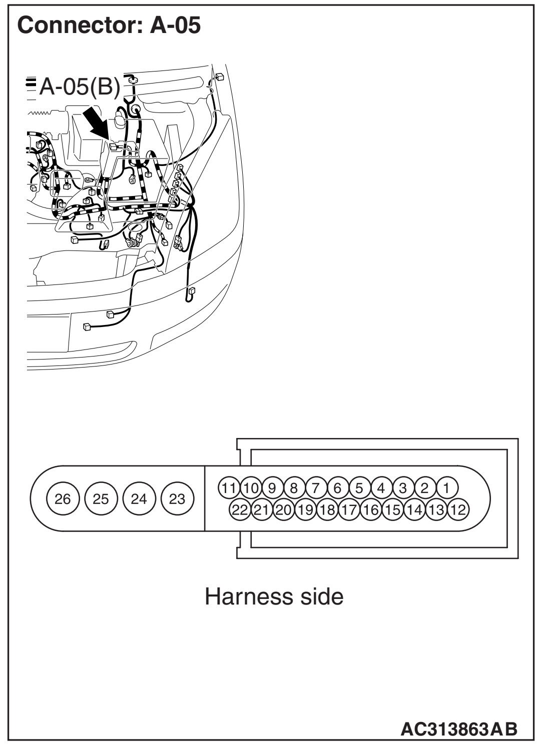
OK: No continuity

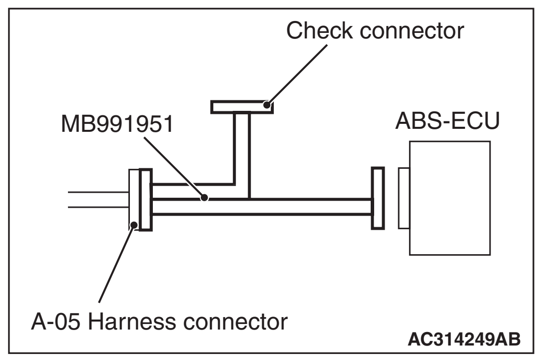
Q: Is the check result normal?

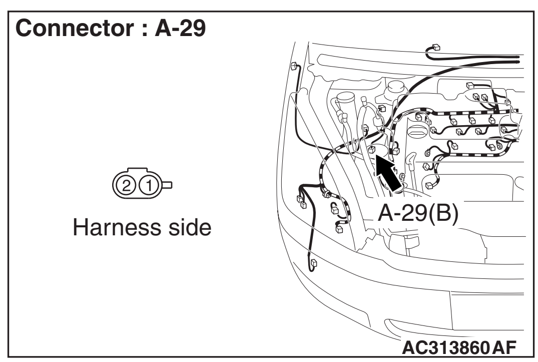
YES : Go to Step 4.

NO : Repair the wiring harness between ABS-ECU connector A-05 and front right wheel speed sensor connector A-29.

STEP 4. Resistance measurement at ABS-ECU connector A-05.



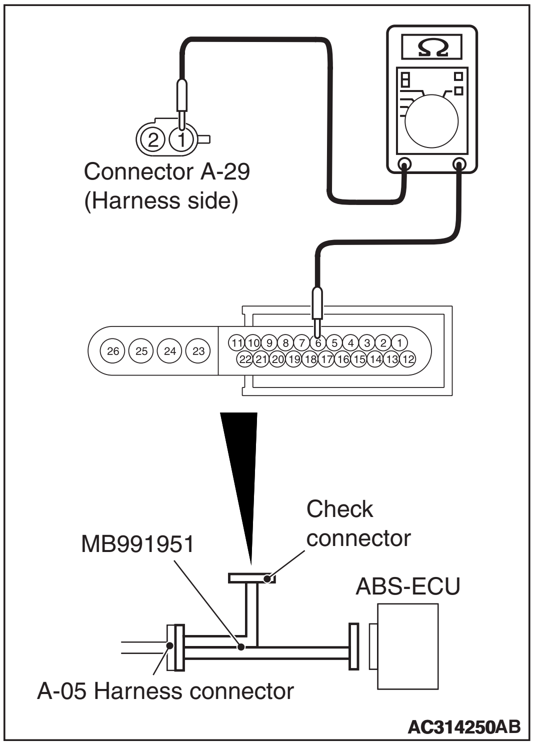




(1) Disconnect the front right wheel speed sensor connector A-29 and ABS-ECU connector A-05, and connect special tool ABS Check Harness (MB991951) to the wiring harness-side connector.

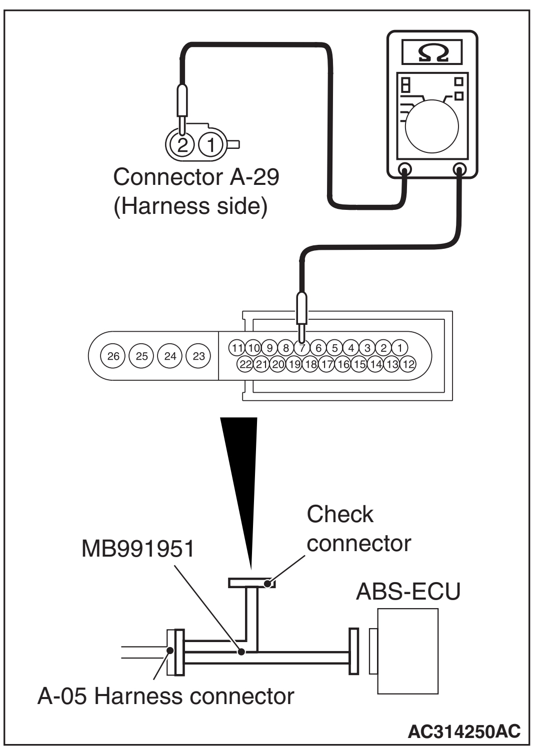
NOTE: Do not connect special tool ABS Check Harness (MB991951) to the ABS-ECU.

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(2) Resistance between ABS-ECU connector A-05 terminal 6 and front right wheel speed sensor A-29 terminal 1

OK: 10 Ω or less



(3) Resistance between ABS-ECU connector A-05 terminal 7 and front right wheel speed sensor A-29 terminal 2

OK: 10 Ω or less

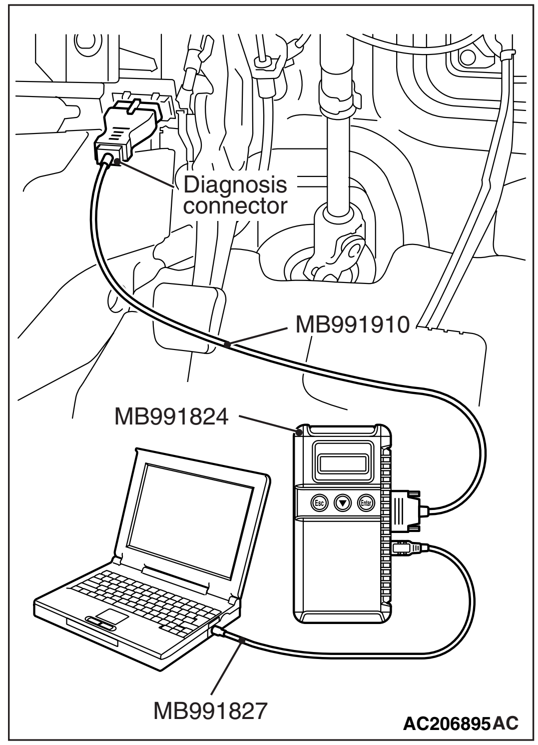
Q: Is the check result normal?

YES : Go to Step 5.

NO : Repair the wiring harness between ABS-ECU connector A-05 and front right wheel speed sensor connector A-29.

STEP 5. Check whether the diagnosis code is reset.

⚠ CAUTION



Before connecting or disconnecting the M.U.T.-III, turn the ignition switch to the "LOCK" (OFF) position.

Check again if the diagnosis code is set.

(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.
(7) Disconnect M.U.T.-III.

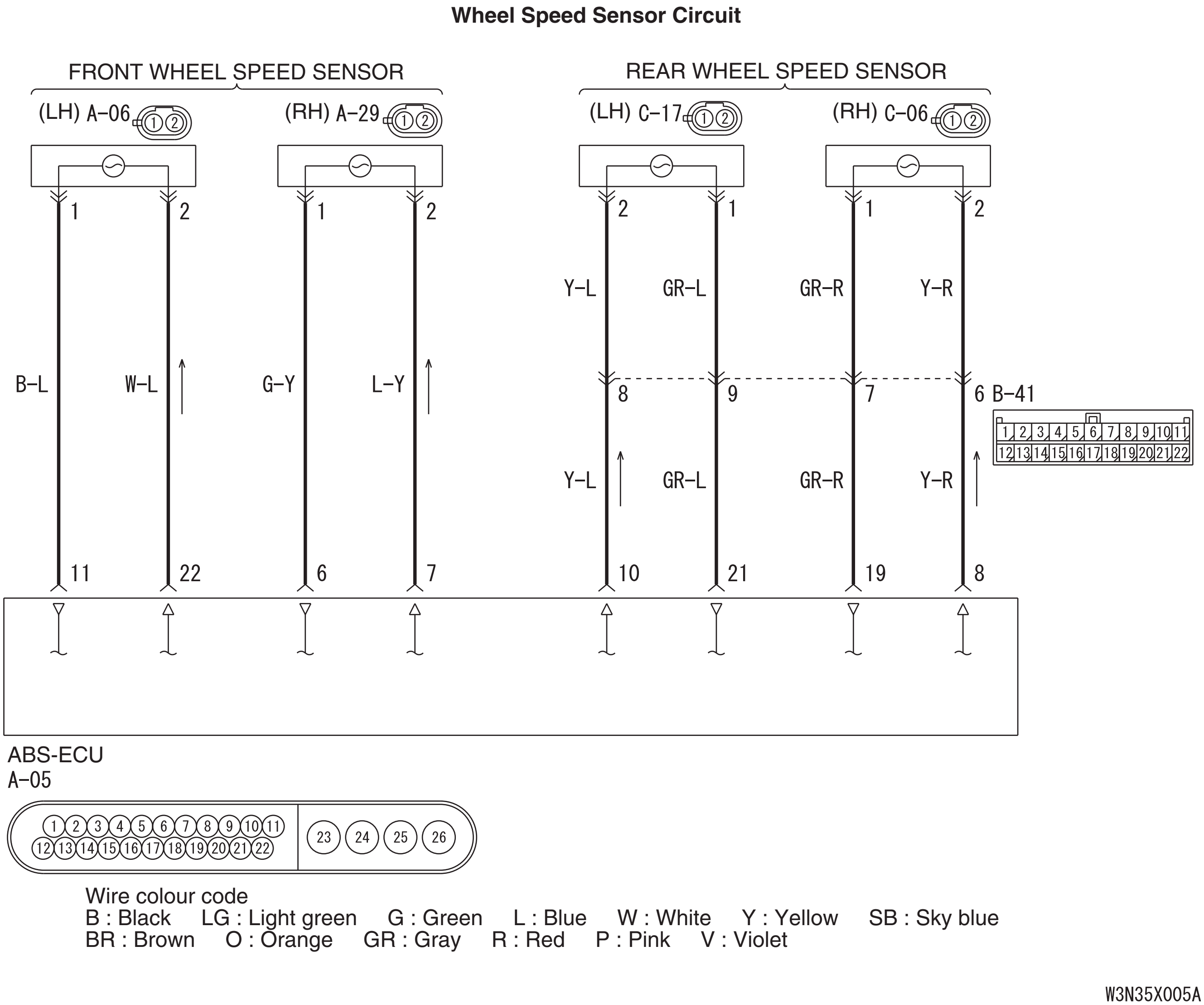
Q: Is code No.C1200 set?

YES : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to P.35B-78).

NO : The malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-13.

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Code No.C1201: Wheel speed sensor (FR) system (sensor output failure)



OPERATION

The wheel speed sensor is a pulse generator. It consists of encoder (a plate on which north and south pole sides of the magnets are arranged alternately) for detecting wheel speed which rotates at the same speed as the road wheels. This sensor sends frequency pulse signals in proportion to wheel speed. The pulse signals, which the wheel speed sensor creates, are sent to the ABS-ECU. The ABS-ECU uses the frequency of the pulse signals to determine the wheel speed.

DIAGNOSIS CODE SET CONDITIONS

The ABS-ECU monitors the signals from the wheel speed sensors during driving. If the ECU detects malfunctions below, it sets the diagnosis code.

- Missing of wheel speed sensor signals
- When an abnormal wheel speed sensor signal is received
- When one of the wheel speed sensor signals (from the front, rear, right and left wheels) is significantly different from the others

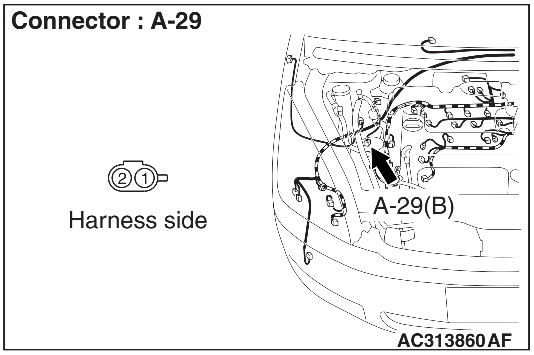
PROBABLE CAUSES

- Improperly installed wheel speed sensor
- Presence of dirt or other foreign particles on the encoder of the wheel speed sensor
- Deformed encoder of the wheel speed sensor
- Excessive gap between the wheel speed sensor and its encoder
- Damaged wiring harness or connector
- Malfunction of the wheel speed sensor
- Malfunction of the hydraulic unit (integrated with ABS-ECU)

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DIAGNOSIS PROCEDURE

STEP 1. Connector check: A-29 front right wheel speed sensor connector



Q: Is the check result normal?

YES : Go to Step 2.
NO : Repair the defective connector.

STEP 2. Remove the front right wheel speed sensor and check it.

Refer to P.35B-81.

Q: Is the check result normal?

YES : Go to Step 3.
NO : Replace the front right wheel speed sensor (Refer to P.35B-80).

STEP 3. Check the wheel bearing for excessive play.

Front: refer to GROUP 26, On-vehicle Service – Wheel Bearing Axial Play Check P.26-5.
Rear: refer to GROUP 27, On-vehicle Service – Wheel Bearing Axial Play Check P.27-3.

Q: Is the check result normal?

YES : Go to Step 4.
NO : Replace the hub assembly (Refer to GROUP 26, Front Axle Hub Assembly P.26-6).

STEP 4. Check the encoder for detecting wheel speed.

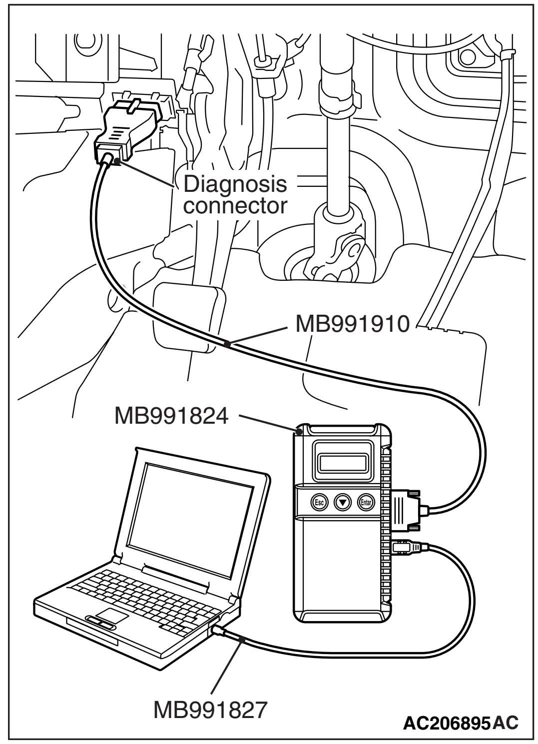
Check the encoder for presence of foreign objects or deformation.

Q: Is the check result normal?

YES : Go to Step 5.
NO : If foreign objects are found, clean the encoder. If deformation is found, replace the hub (Refer to GROUP 26, Front Axle Hub Assembly P.26-9).

STEP 5. Check whether the diagnosis code is reset.

⚠ CAUTION



Before connecting or disconnecting the M.U.T.-III, turn the ignition switch to the "LOCK" (OFF) position.

Check again if the diagnosis code is set.

(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.
(7) Disconnect M.U.T.-III.

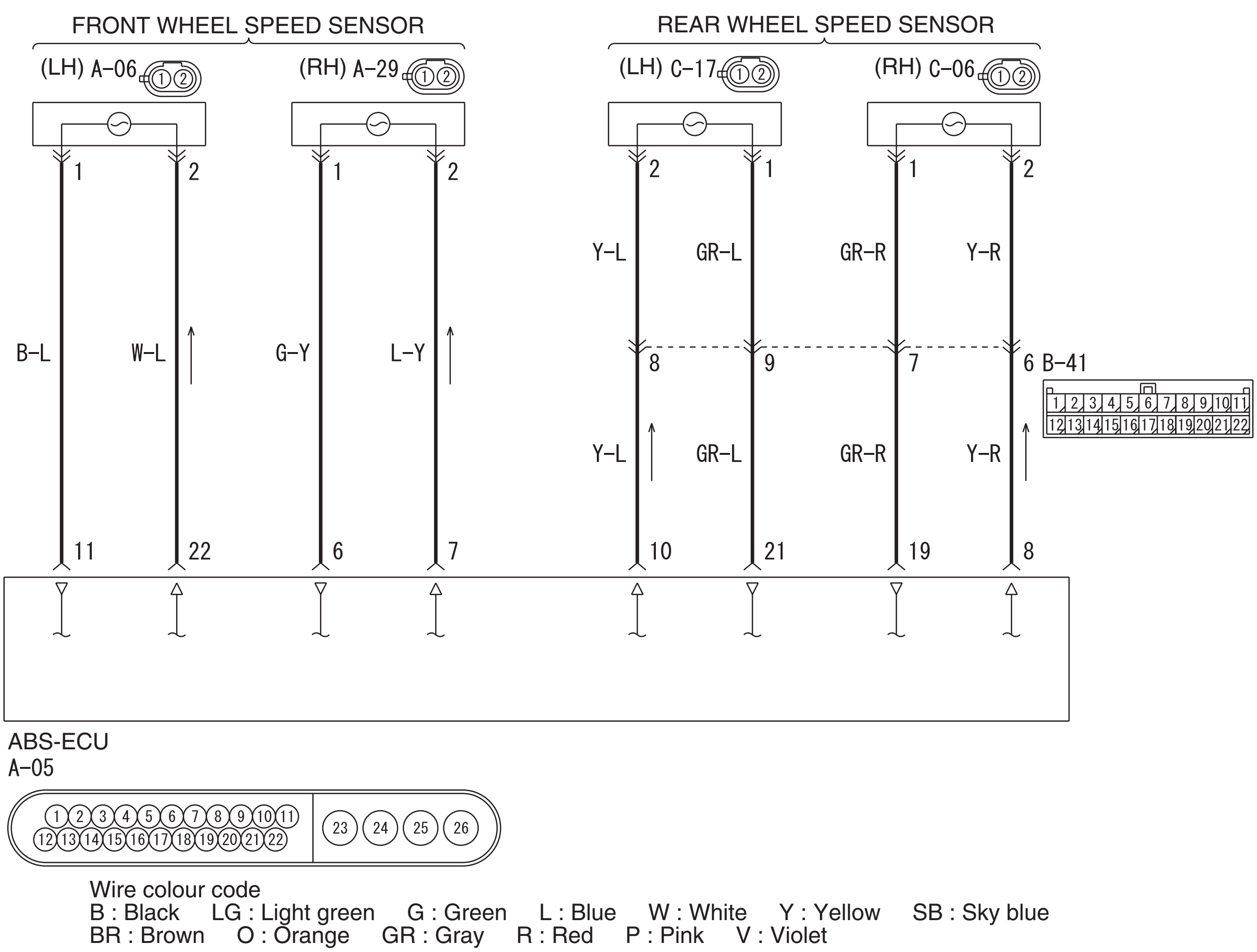
Q: Is code No.C1201 set?

YES : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to P.35B-78).
NO : The malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-13.

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Code No.C1205: Wheel speed sensor (FL) system (open circuit, short to earth or power supply)

Wheel Speed Sensor Circuit



W3N35X005A

OPERATION

The wheel speed sensor is a pulse generator. It consists of encoder (a plate on which north and south pole sides of the magnets are arranged alternately) for detecting wheel speed which rotates at the same speed as the road wheels. This sensor sends frequency pulse signals in proportion to wheel speed. The pulse signals, which the wheel speed sensor creates, are sent to the ABS-ECU. The ABS-ECU uses the frequency of the pulse signals to determine the wheel speed.

DIAGNOSIS CODE SET CONDITIONS

The ABS-ECU monitors the voltage change in each of the wheel speed sensor circuits. If the ECU detects an open or short circuit in any of the circuits, the ECU sets the diagnosis code.

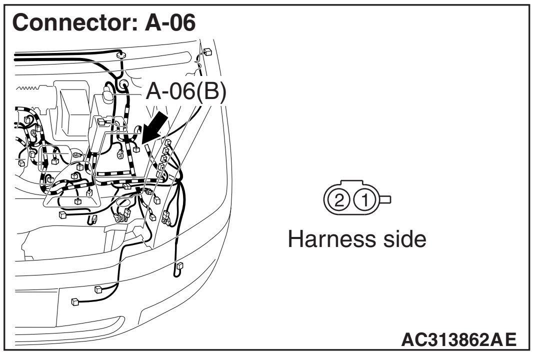
PROBABLE CAUSES

- Damaged wiring harness or connector
- Malfunction of the wheel speed sensor
- Malfunction of the hydraulic unit (integrated with ABS-ECU)

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DIAGNOSIS PROCEDURE

STEP 1. Connector check: A-06 front left wheel speed sensor connector



Q: Is the check result normal?

YES : Go to Step 2.
NO : Repair the defective connector.

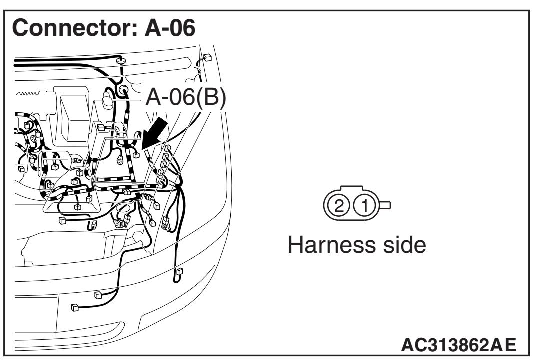
STEP 2. Remove the front left wheel speed sensor and check it.

Refer to P.35B-81.

Q: Is the check result normal?

YES : Go to Step 3.
NO : Replace the front left wheel speed sensor (Refer to P.35B-80).

STEP 3. Check the front left wheel speed sensor connector A-06.

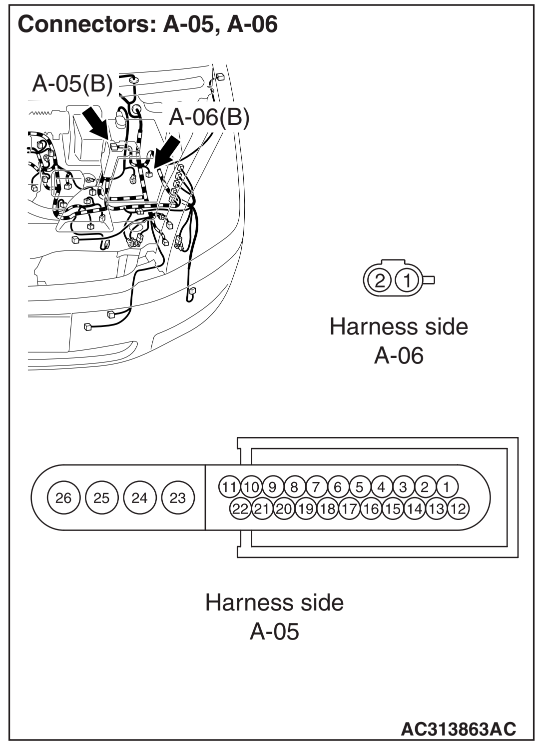


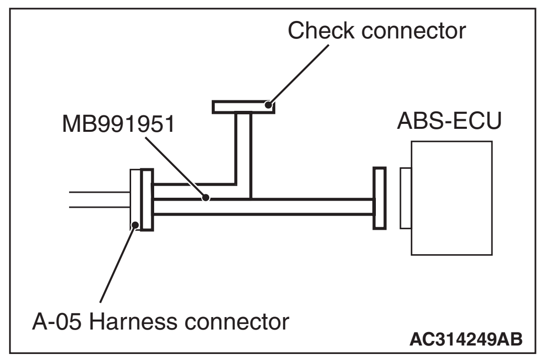
Check the connectors, for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Is the check result normal?

YES : Go to Step 4.
NO : Repair or replace the damaged component(s). Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – Connector Inspection Service Points P.00-11.

STEP 4. Check the continuity (short to earth) at ABS-ECU connector A-05.

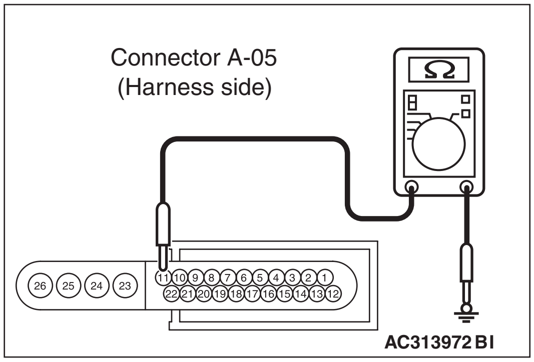




(1) Disconnect the front left wheel speed sensor connector A-06 and ABS-ECU connector A-05, and connect special tool ABS Check Harness (MB991951) to the wiring harness-side connector.

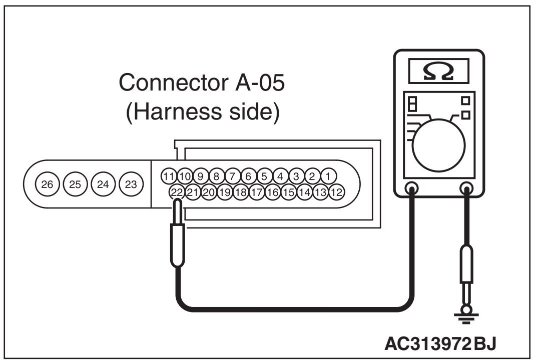
NOTE: Do not connect special tool ABS Check Harness (MB991951) to the ABS-ECU.

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(2) Continuity between ABS-ECU connector A-05 terminal 11 and body earth

OK: No continuity



(3) Continuity between ABS-ECU connector A-05 terminal 22 and body earth

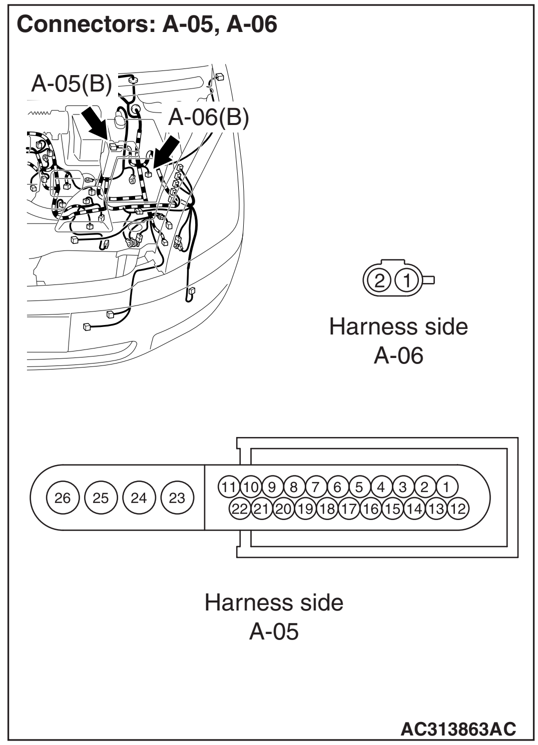
OK: No continuity

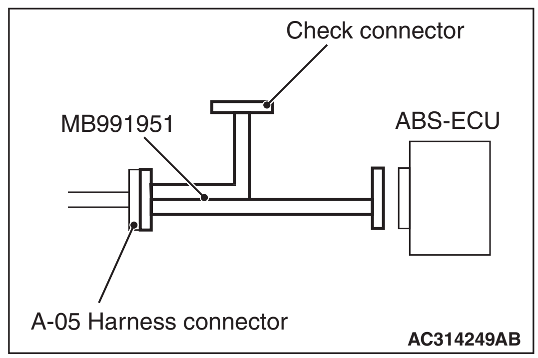
Q: Is the check result normal?

YES : Go to Step 5.

NO : Repair the wiring harness between ABS-ECU connector A-05 and front left wheel speed sensor connector A-06.

STEP 5. Resistance measurement at ABS-ECU connector A-05.

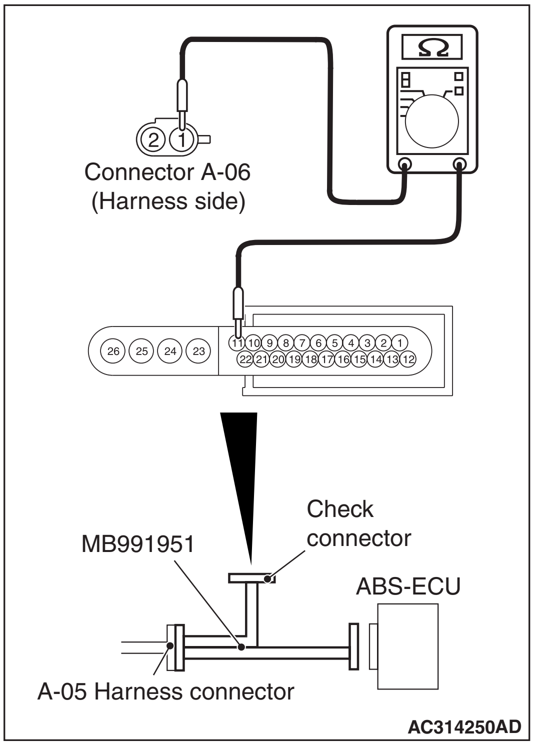




(1) Disconnect the front left wheel speed sensor connector A-06 and ABS-ECU connector A-05, and connect special tool ABS Check Harness (MB991951) to the wiring harness-side connector.

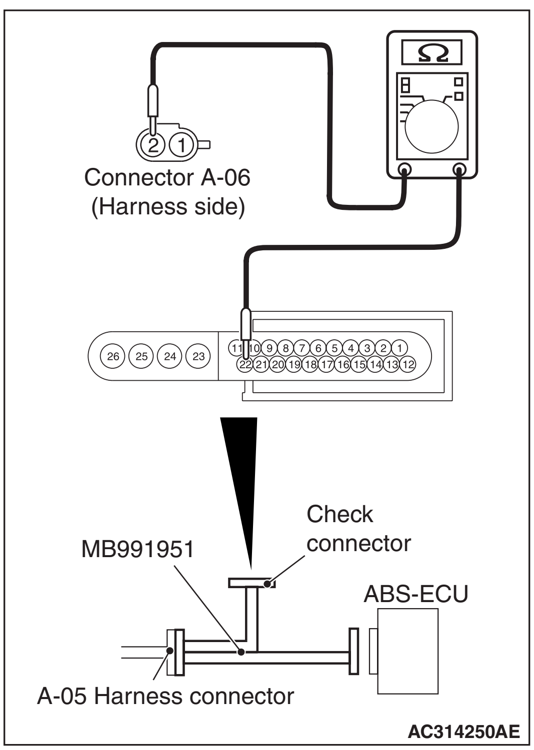
NOTE: Do not connect special tool ABS Check Harness (MB991951) to the ABS-ECU.

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(2) Resistance between ABS-ECU connector A-05 terminal 11 and front left wheel speed sensor A-06 terminal 1

OK: 10 Ω or less



(3) Resistance between ABS-ECU connector A-05 terminal 22 and front left wheel speed sensor A-06 terminal 2

OK: 10 Ω or less

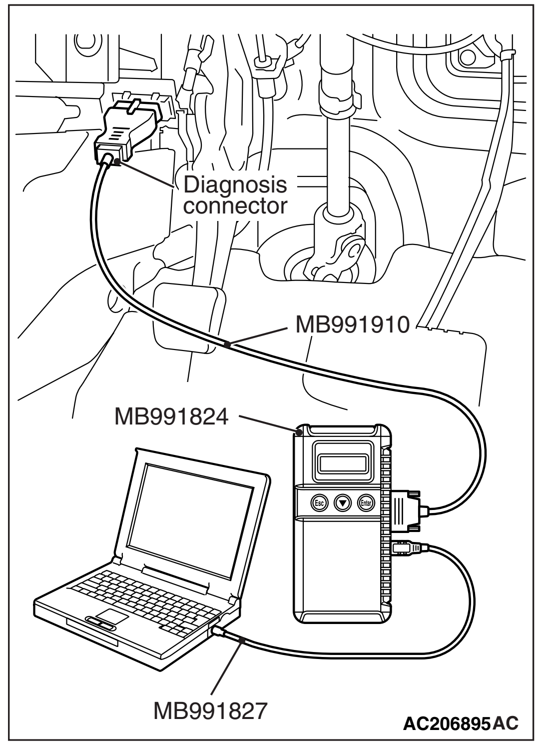
Q: Is the check result normal?

YES : Go to Step 6.

NO : Repair the wiring harness between ABS-ECU connector A-05 and front left wheel speed sensor connector A-06.

STEP 6. Check whether the diagnosis code is reset.

⚠ CAUTION



Before connecting or disconnecting the M.U.T.-III, turn the ignition switch to the "LOCK" (OFF) position.

Check again if the diagnosis code is set.

(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.
(7) Disconnect M.U.T.-III.

Q: Is code No.C1205 set?

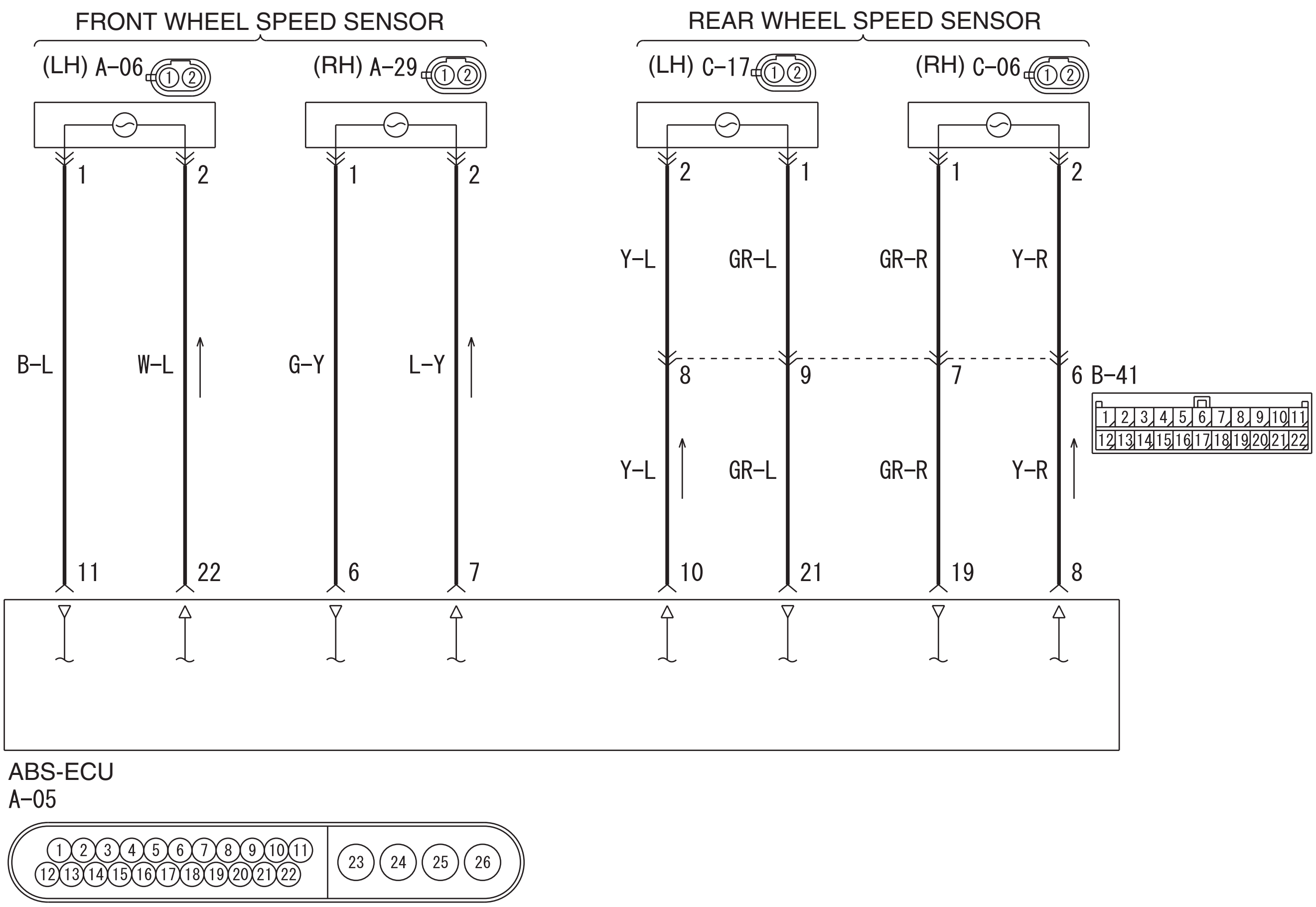
YES : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to P.35B-78).

NO : The malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-13.

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Code No.C1206: Wheel speed sensor (FL) system (sensor output failure)

Wheel Speed Sensor Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Gray R : Red P : Pink V : Violet

W3N35X005A

OPERATION

The wheel speed sensor is a pulse generator. It consists of encoder (a plate on which north and south pole sides of the magnets are arranged alternately) for detecting wheel speed which rotates at the same speed as the road wheels. This sensor sends frequency pulse signals in proportion to wheel speed. The pulse signals, which the wheel speed sensor creates, are sent to the ABS-ECU. The ABS-ECU uses the frequency of the pulse signals to determine the wheel speed.

DIAGNOSIS CODE SET CONDITIONS

The ABS-ECU monitors the signals from the wheel speed sensors during driving. If the ECU detects malfunctions below, it sets the diagnosis code.

- Missing of wheel speed sensor signals
- When an abnormal wheel speed sensor signal is received
- When one of the wheel speed sensor signals (from the front, rear, right and left wheels) is significantly different from the others

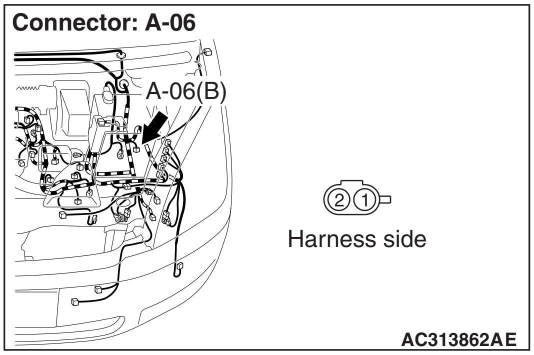
PROBABLE CAUSES

- Improperly installed wheel speed sensor
- Presence of dirt or other foreign particles on the encoder of the wheel speed sensor
- Deformed encoder of the wheel speed sensor
- Excessive gap between the wheel speed sensor and its encoder
- Damaged wiring harness or connector
- Malfunction of the wheel speed sensor
- Malfunction of the hydraulic unit (integrated with ABS-ECU)

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DIAGNOSIS PROCEDURE

STEP 1. Connector check: A-06 front left wheel speed sensor connector



Q: Is the check result normal?

YES : Go to Step 2.

NO : Repair the defective connector.

STEP 2. Remove the front left wheel speed sensor and check it.

Refer to P.35B-81.

Q: Is the check result normal?

YES : Go to Step 3.

NO : Replace the front left wheel speed sensor (Refer to P.35B-80).

STEP 3. Check the wheel bearing for excessive play.

Refer to GROUP 26, On-vehicle Service – Wheel Bearing Play Check P.26-5.

Q: Is the check result normal?

YES : Go to Step 4.

NO : Replace the hub assembly (Refer to GROUP 26, Front Axle Hub Assembly P.26-6).

STEP 4. Check the encoder for detecting wheel speed.

Check the encoder for presence of foreign objects or deformation.

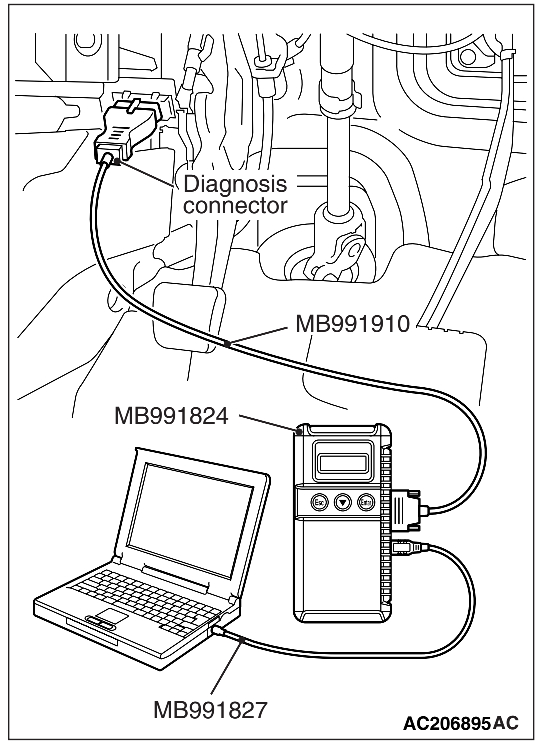
Q: Is the check result normal?

YES : Go to Step 5.

NO : If foreign objects are found, clean the encoder. If deformation is found, replace the hub (Refer to GROUP 26, Front Axle Hub Assembly P.26-9).

STEP 5. Check whether the diagnosis code is reset.

⚠ CAUTION



Before connecting or disconnecting the M.U.T.-III, turn the ignition switch to the "LOCK" (OFF) position.

Check again if the diagnosis code is set.

(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.
(7) Disconnect M.U.T.-III.

Q: Is code No.C1206 set?

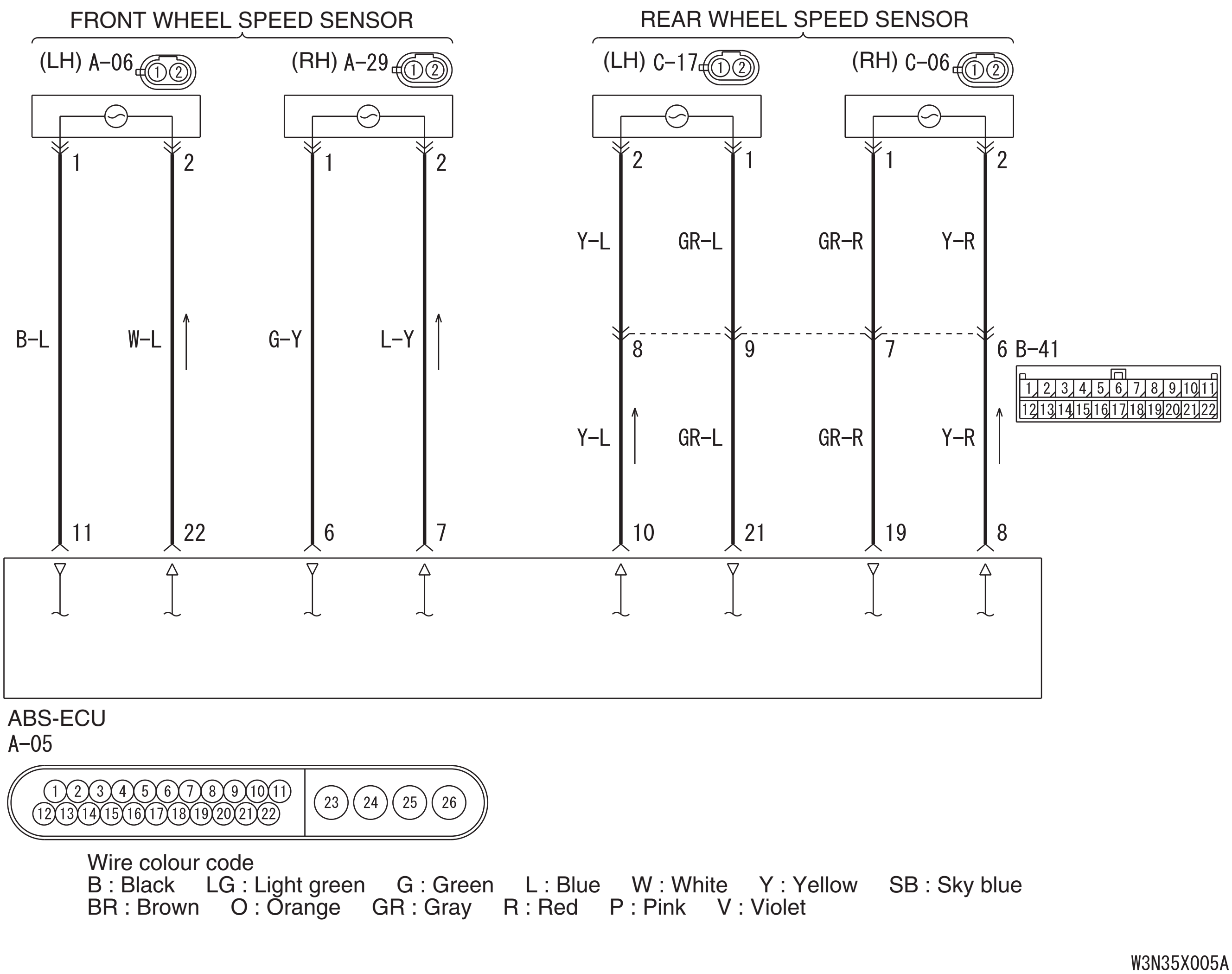
YES : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to P.35B-78).

NO : The malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-13.

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Code No.C1210: Wheel speed sensor (RR) system (open circuit, short to earth or power supply)

Wheel Speed Sensor Circuit



OPERATION

The wheel speed sensor is a pulse generator. It consists of encoder (a plate on which north and south pole sides of the magnets are arranged alternately) for detecting wheel speed which rotates at the same speed as the road wheels. This sensor sends frequency pulse signals in proportion to wheel speed. The pulse signals, which the wheel speed sensor creates, are sent to the ABS-ECU. The ABS-ECU uses the frequency of the pulse signals to determine the wheel speed.

DIAGNOSIS CODE SET CONDITIONS

The ABS-ECU monitors the voltage change in each of the wheel speed sensor circuits. If the ECU detects an open or short circuit in any of the circuits, the ECU sets the diagnosis code.

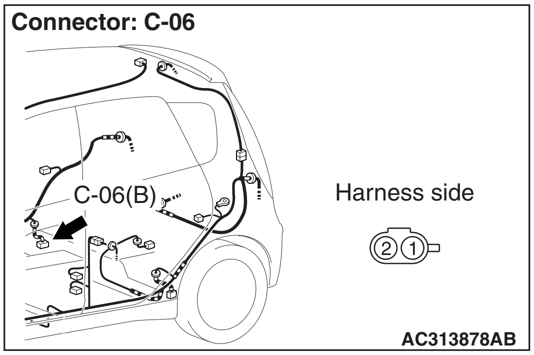
PROBABLE CAUSES

- Damaged wiring harness or connector
- Malfunction of the wheel speed sensor
- Malfunction of the hydraulic unit (integrated with ABS-ECU)

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DIAGNOSIS PROCEDURE

STEP 1. Connector check: C-06 rear right wheel speed sensor connector



Q: Is the check result normal?

YES : Go to Step 2.
NO : Repair the defective connector.

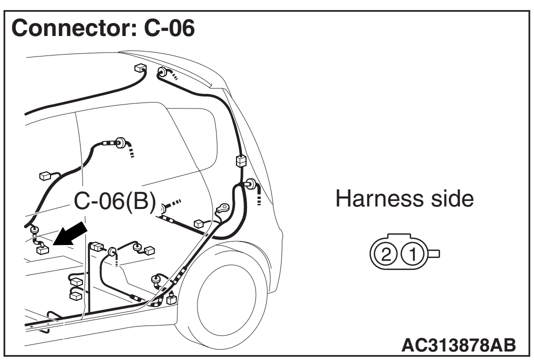
STEP 2. Remove the rear right wheel speed sensor and check it.

Refer to P.35B-81.

Q: Is the check result normal?

YES : Go to Step 3.
NO : Replace the rear right wheel speed sensor (Refer to P.35B-80).

STEP 3. Check the rear right wheel speed sensor connector C-06.

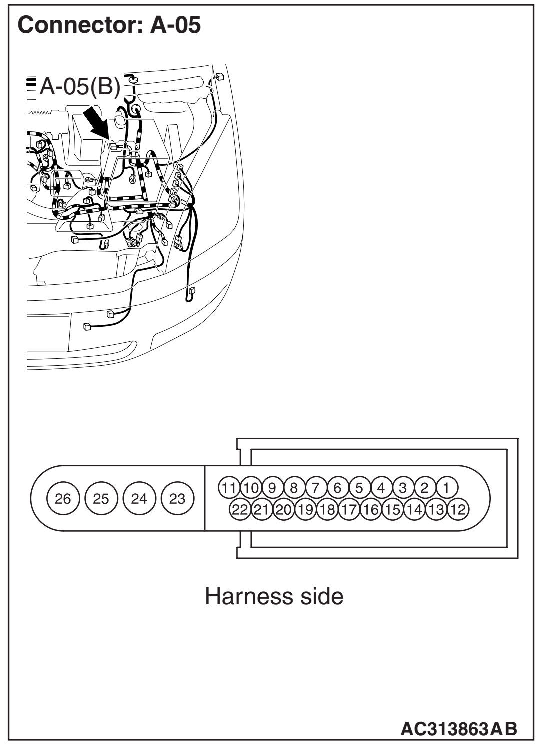


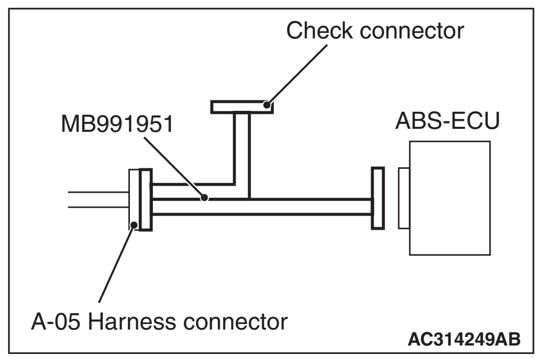
Check the connectors, for loose, corroded or damaged terminals, or terminals pushed back in the connector.

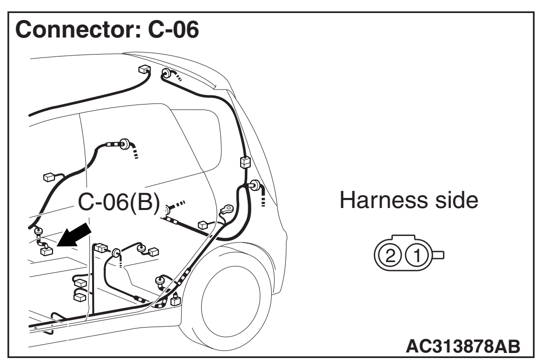
Q: Is the check result normal?

YES : Go to Step 4.
NO : Repair or replace the damaged component(s). Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – Connector Inspection Service Points P.00-11.

STEP 4. Check the continuity (short to earth) at ABS-ECU connector A-05.



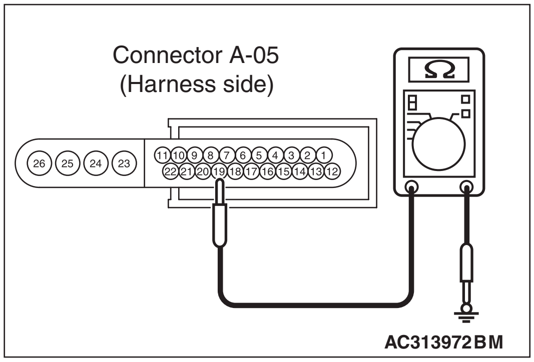




(1) Disconnect the rear right wheel speed sensor connector C-06 and ABS-ECU connector A-05, and connect special tool ABS Check Harness (MB991951) to the wiring harness-side connector.

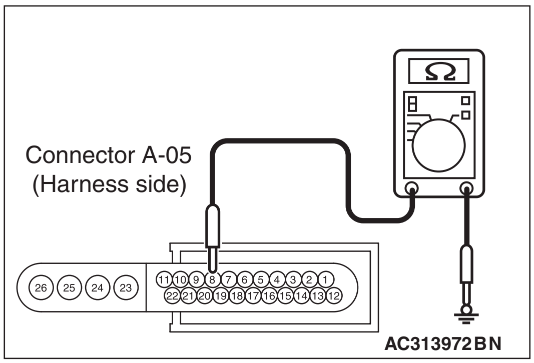
NOTE: Do not connect special tool ABS Check Harness (MB991951) to the ABS-ECU.

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(2) Continuity between ABS-ECU connector A-05 terminal 19 and body earth

OK: No continuity



(3) Continuity between ABS-ECU connector A-05 terminal 8 and body earth

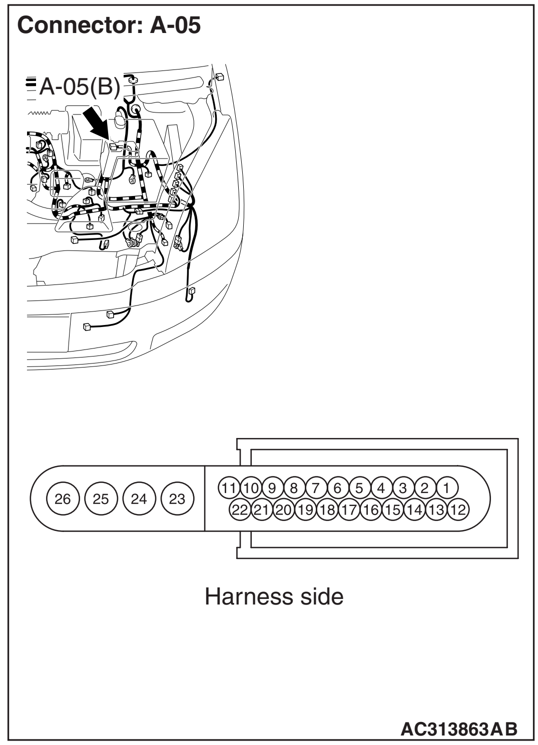
OK: No continuity

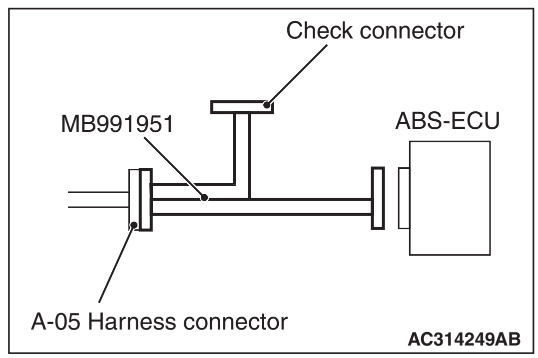
Q: Is the check result normal?

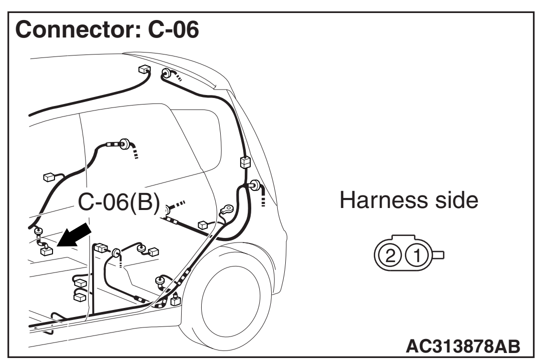
YES : Go to Step 5.

NO : Repair the wiring harness between ABS-ECU connector A-05 and rear right wheel speed sensor connector C-06.

STEP 5. Resistance measurement at ABS-ECU connector A-05.



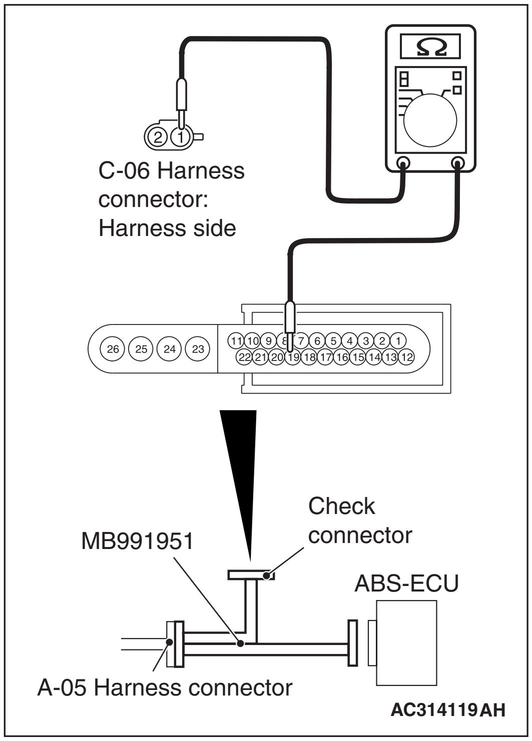




(1) Disconnect the rear right wheel speed sensor connector C-06 and ABS-ECU connector A-05, and connect special tool ABS Check Harness (MB991951) to the wiring harness-side connector.

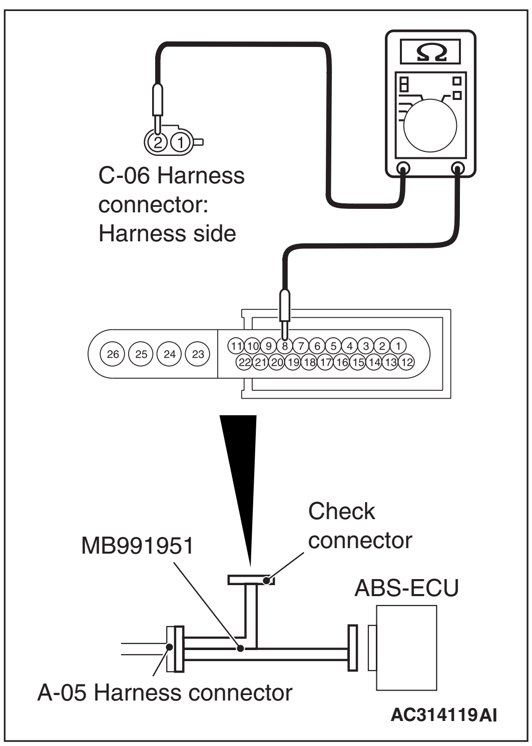
NOTE: Do not connect special tool ABS Check Harness (MB991951) to the ABS-ECU.

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(2) Resistance between ABS-ECU connector A-05 terminal 19 and rear right wheel speed sensor C-06 terminal 1

OK: 10 Ω or less



(3) Resistance between ABS-ECU connector A-05 terminal 8 and rear right wheel speed sensor C-06 terminal 2

OK: 10 Ω or less

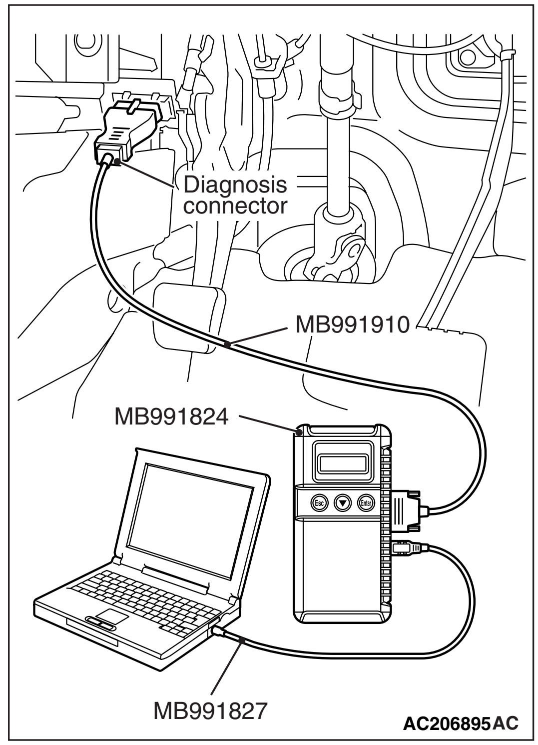
Q: Is the check result normal?

YES : Go to Step 6.

NO : Repair the wiring harness between ABS-ECU connector A-05 and rear right wheel speed sensor connector C-06.

STEP 6. Check whether the diagnosis code is reset.

⚠ CAUTION



Before connecting or disconnecting the M.U.T.-III, turn the ignition switch to the "LOCK" (OFF) position.

Check again if the diagnosis code is set.

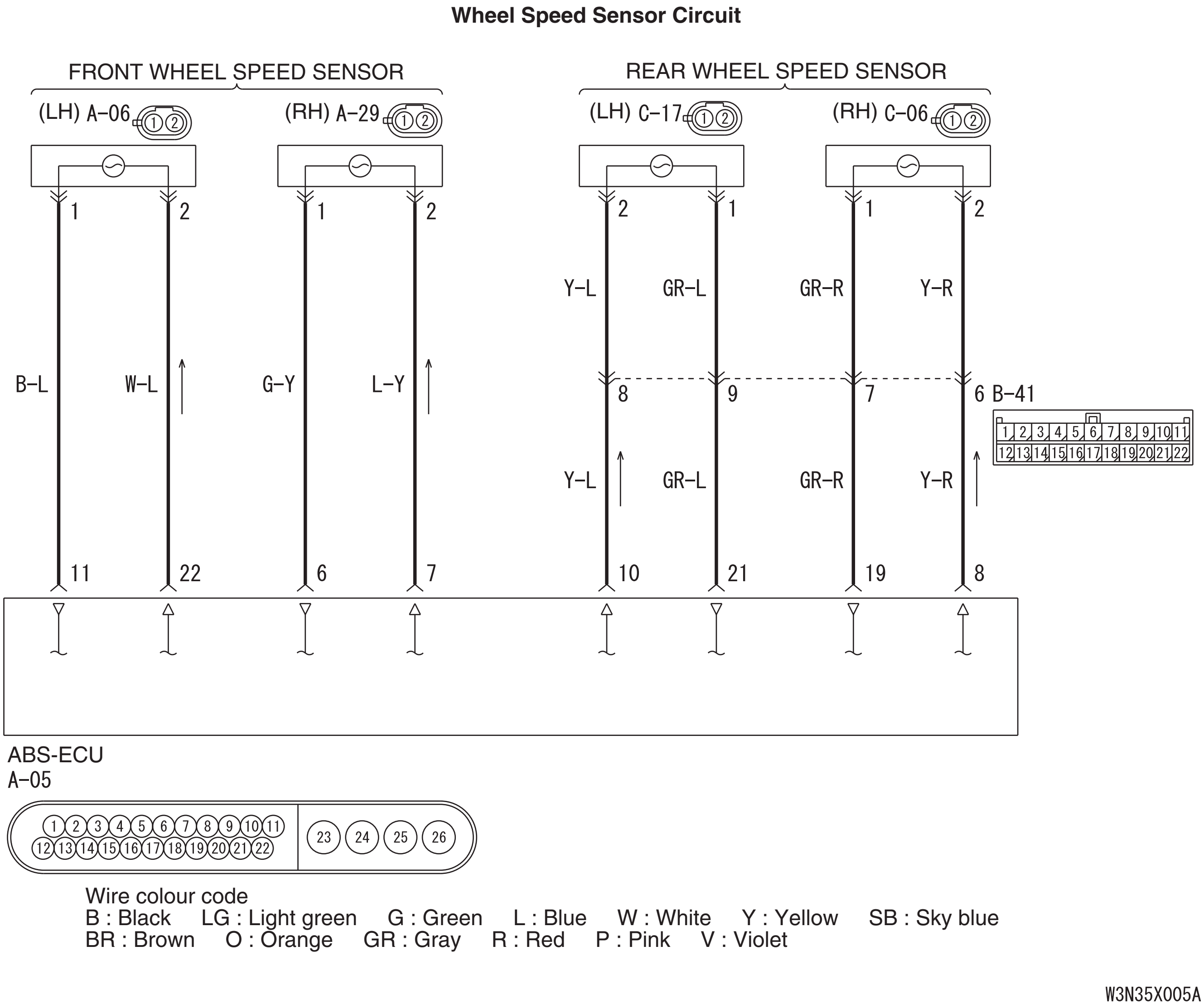
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.
(7) Disconnect M.U.T.-III.

Q: Is code No.C1210 set?

YES : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to P.35B-78).

NO : The malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-13.

Code No.C1211: Wheel speed sensor (RR) system (sensor output failure)



OPERATION

The wheel speed sensor is a pulse generator. It consists of encoder (a plate on which north and south pole sides of the magnets are arranged alternately) for detecting wheel speed which rotates at the same speed as the road wheels. This sensor sends frequency pulse signals in proportion to wheel speed. The pulse signals, which the wheel speed sensor creates, are sent to the ABS-ECU. The ABS-ECU uses the frequency of the pulse signals to determine the wheel speed.

DIAGNOSIS CODE SET CONDITIONS

The ABS-ECU monitors the signals from the wheel speed sensors during driving. If the ECU detects malfunctions below, it sets the diagnosis code.

- Missing of wheel speed sensor signals
- When an abnormal wheel speed sensor signal is received
- When one of the wheel speed sensor signals (from the front, rear, right and left wheels) is significantly different from the others

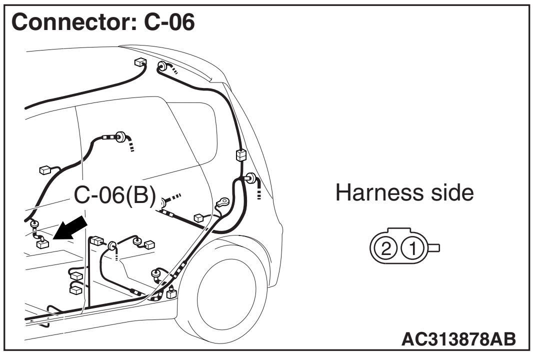
PROBABLE CAUSES

- Improperly installed wheel speed sensor
- Presence of dirt or other foreign particles on the encoder of the wheel speed sensor
- Deformed encoder of the wheel speed sensor
- Excessive gap between the wheel speed sensor and its encoder
- Damaged wiring harness or connector
- Malfunction of the wheel speed sensor
- Malfunction of the hydraulic unit (integrated with ABS-ECU)

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DIAGNOSIS PROCEDURE

STEP 1. Connector check: C-06 rear right wheel speed Sensor connector



Q: Is the check result normal?

YES : Go to Step 2.
NO : Repair the defective connector.

STEP 2. Remove the rear right wheel speed sensor and check it.

Refer to P.35B-81.

Q: Is the check result normal?

YES : Go to Step 3.
NO : Replace the rear right wheel speed sensor (Refer to P.35B-80).

STEP 3. Check the wheel bearing for excessive play.

Refer to GROUP 27, On-vehicle Service – Wheel Bearing Axial Play Check P.27-3.

Q: Is the check result normal?

YES : Go to Step 4.
NO : Replace the hub assembly (Refer to GROUP 27, Rear Axle Hub P.27-6).

STEP 4. Check the encoder for detecting wheel speed.

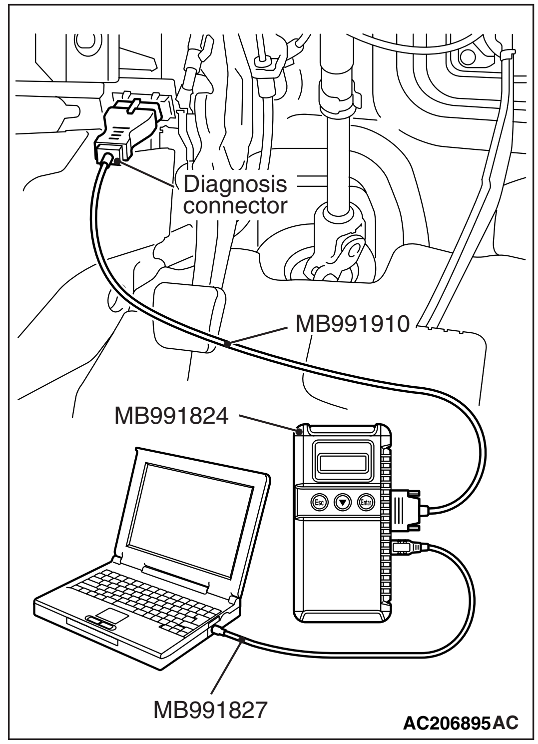
Check the encoder for presence of foreign objects or deformation.

Q: Is the check result normal?

YES : Go to Step 5.
NO : If foreign objects are found, clean the encoder. If deformation is found, replace the hub (Refer to GROUP 27, Rear Axle Hub P.27-6).

STEP 5. Check whether the diagnosis code is reset.

⚠ CAUTION



Before connecting or disconnecting the M.U.T.-III, turn the ignition switch to the "LOCK" (OFF) position.

Check again if the diagnosis code is set.

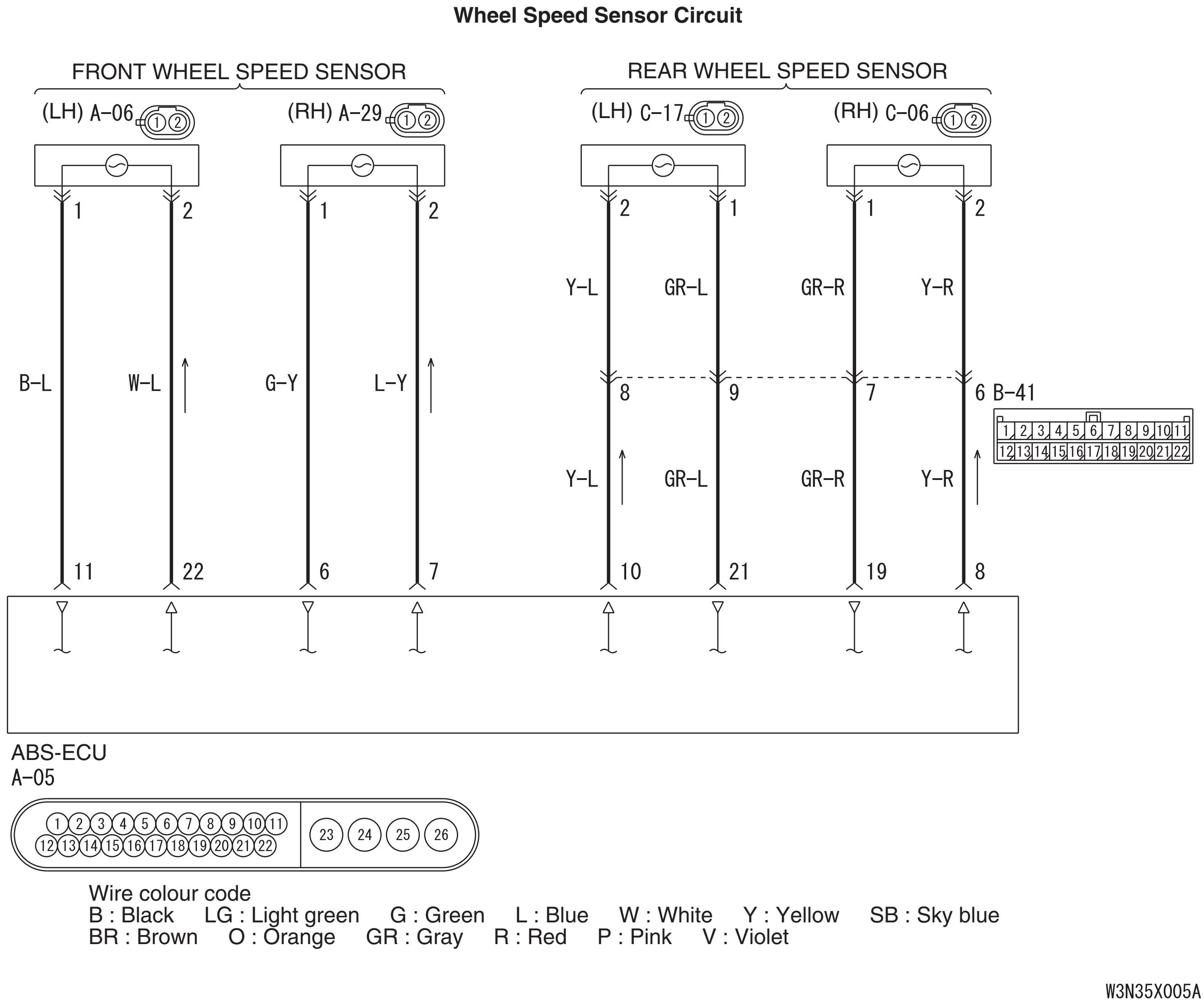
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.
(7) Disconnect M.U.T.-III.

Q: Is code No.C1211 set?

YES : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to P.35B-78).
NO : The malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-13.

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Code No.C1215: Wheel speed sensor (RL) system (open circuit, short to earth or power supply)



OPERATION

The wheel speed sensor is a pulse generator. It consists of encoder (a plate on which north and south pole sides of the magnets are arranged alternately) for detecting wheel speed which rotates at the same speed as the road wheels. This sensor sends frequency pulse signals in proportion to wheel speed. The pulse signals, which the wheel speed sensor creates, are sent to the ABS-ECU. The ABS-ECU uses the frequency of the pulse signals to determine the wheel speed.

DIAGNOSIS CODE SET CONDITIONS

The ABS-ECU monitors the voltage change in each of the wheel speed sensor circuits. If the ECU detects an open or short circuit in any of the circuits, the ECU sets the diagnosis code.

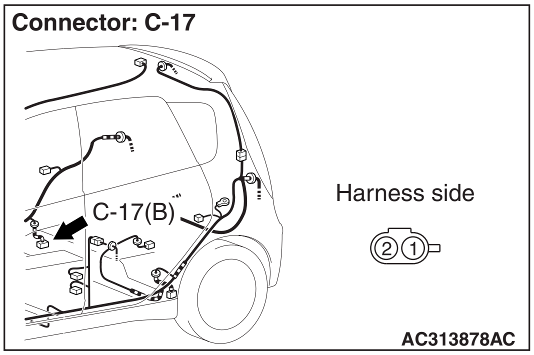
PROBABLE CAUSES

- Damaged wiring harness or connector
- Malfunction of the wheel speed sensor
- Malfunction of the hydraulic unit (integrated with ABS-ECU)

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DIAGNOSIS PROCEDURE

STEP 1. Connector check: C-17 rear left wheel speed sensor connector



Q: Is the check result normal?

YES : Go to Step 2.
NO : Repair the defective connector.

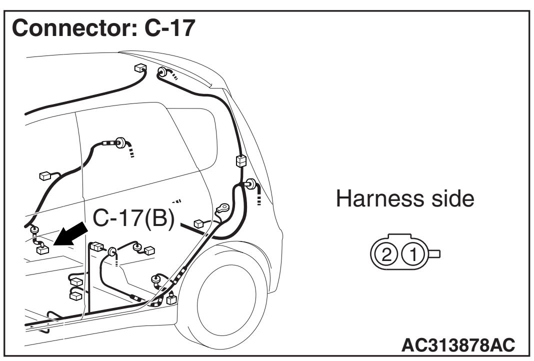
STEP 2. Remove the rear left wheel speed sensor and check it.

Refer to P.35B-81.

Q: Is the check result normal?

YES : Go to Step 3.
NO : Replace the rear left wheel speed sensor (Refer to P.35B-80).

STEP 3. Check the rear left wheel speed sensor connector C-17.

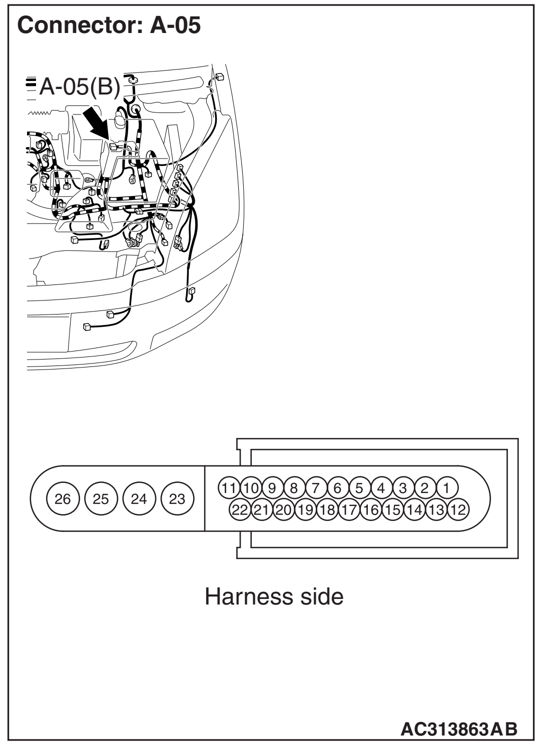


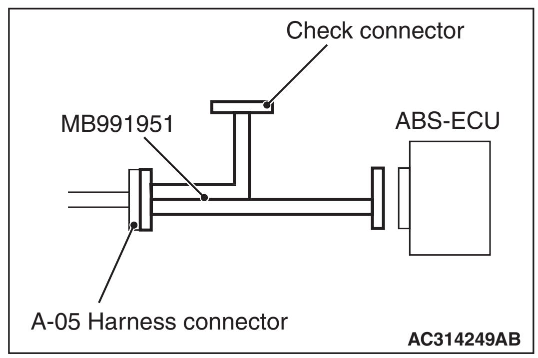
Check the connectors, for loose, corroded or damaged terminals, or terminals pushed back in the connector.

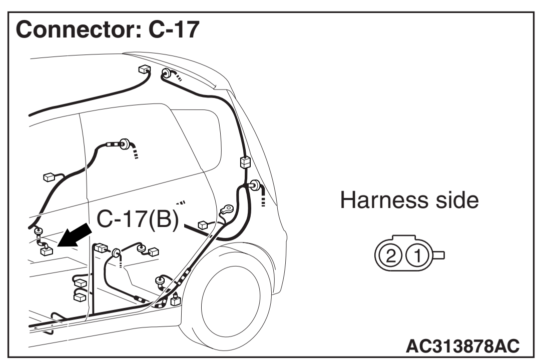
Q: Is the check result normal?

YES : Go to Step 4.
NO : Repair or replace the damaged component(s). Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – Connector Inspection Service Points P.00-11.

STEP 4. Check the continuity (short to earth) at ABS-ECU connector A-05.



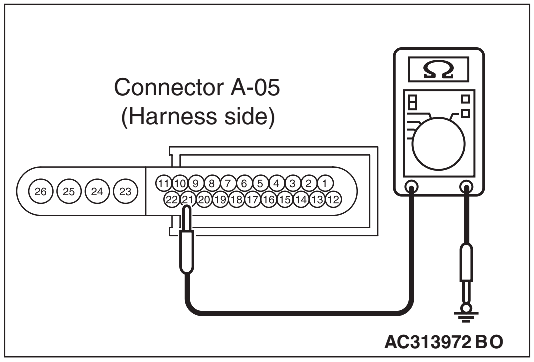




(1) Disconnect the rear left wheel speed sensor connector C-17 and ABS-ECU connector A-05, and connect special tool ABS Check Harness (MB991951) to the wiring harness-side connector.

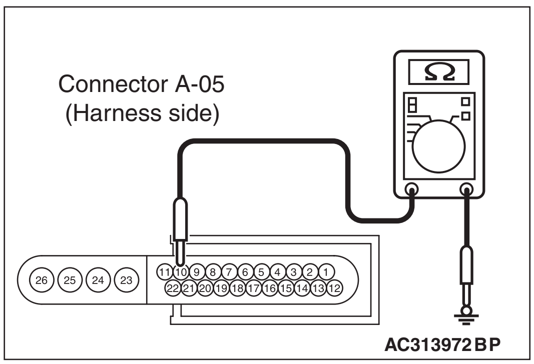
NOTE: Do not connect special tool ABS Check Harness (MB991951) to the ABS-ECU.

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(2) Continuity between ABS-ECU connector A-05 terminal 21 and body earth

OK: No continuity



(3) Continuity between ABS-ECU connector A-05 terminal 10 and body earth

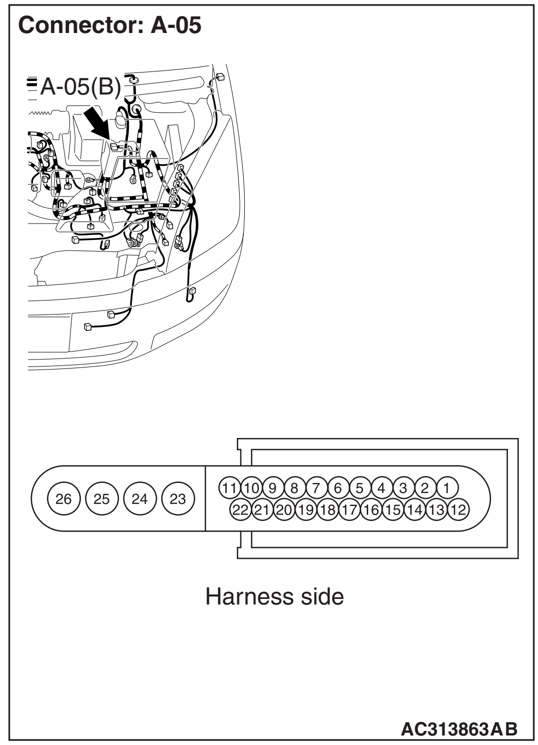
OK: No continuity

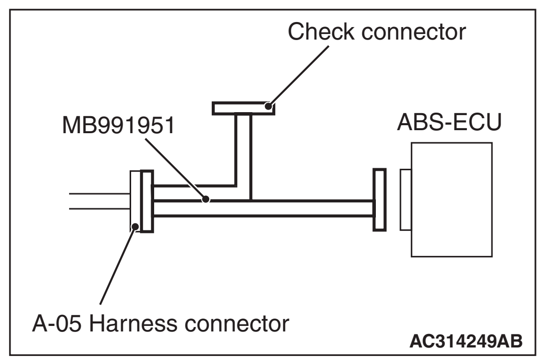
Q: Is the check result normal?

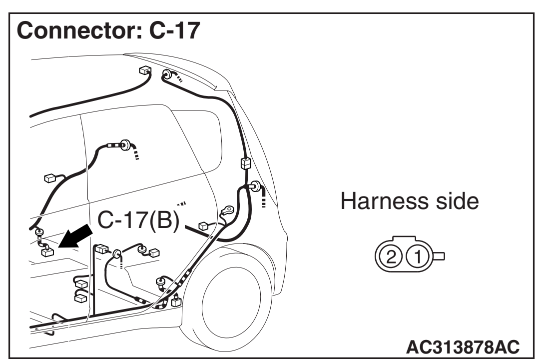
YES : Go to Step 5.

NO : Repair the wiring harness between ABS-ECU connector A-05 and rear left wheel speed sensor connector C-17.

STEP 5. Resistance measurement at ABS-ECU connector A-05.



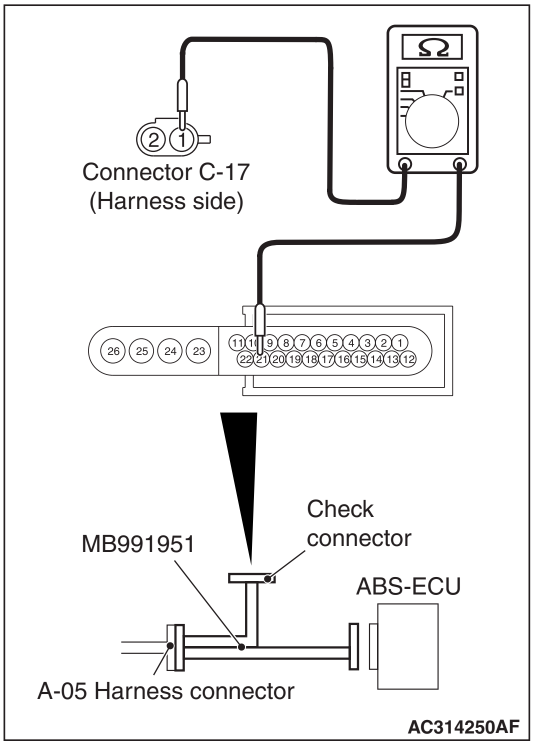




(1) Disconnect the rear left wheel speed sensor connector C-17 and ABS-ECU connector A-05, and connect special tool ABS Check Harness (MB991951) to the wiring harness-side connector.

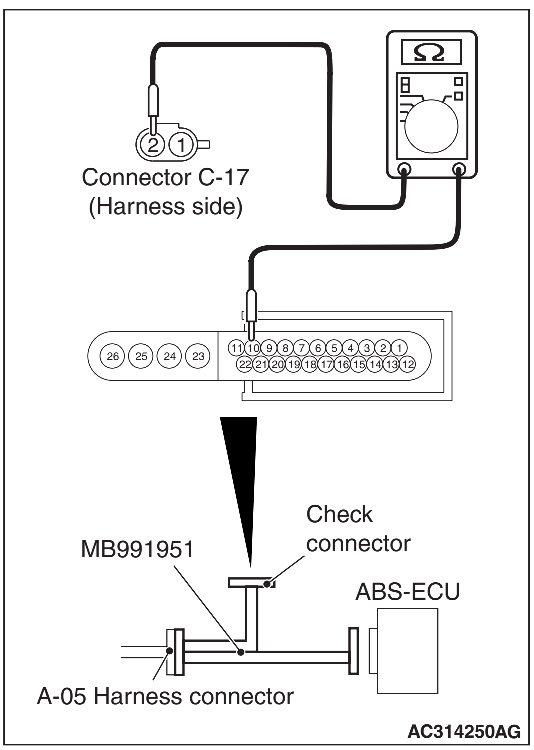
NOTE: Do not connect special tool ABS Check Harness (MB991951) to the ABS-ECU.

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(2) Resistance between ABS-ECU connector A-05 terminal 21 and rear left wheel speed sensor C-17 terminal 1

OK: 10 Ω or less



(3) Resistance between ABS-ECU connector A-05 terminal 10 and rear left wheel speed sensor C-17 terminal 2

OK: 10 Ω or less

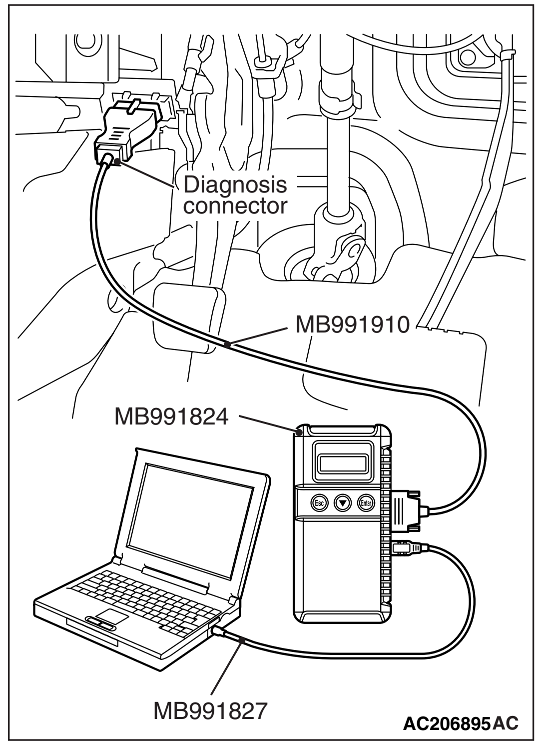
Q: Is the check result normal?

YES : Go to Step 6.

NO : Repair the wiring harness between ABS-ECU connector A-05 and rear left wheel speed sensor connector C-17.

STEP 6. Check whether the diagnosis code is reset.

⚠ CAUTION



Before connecting or disconnecting the M.U.T.-III, turn the ignition switch to the "LOCK" (OFF) position.

Check again if the diagnosis code is set.

(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.
(7) Disconnect M.U.T.-III.

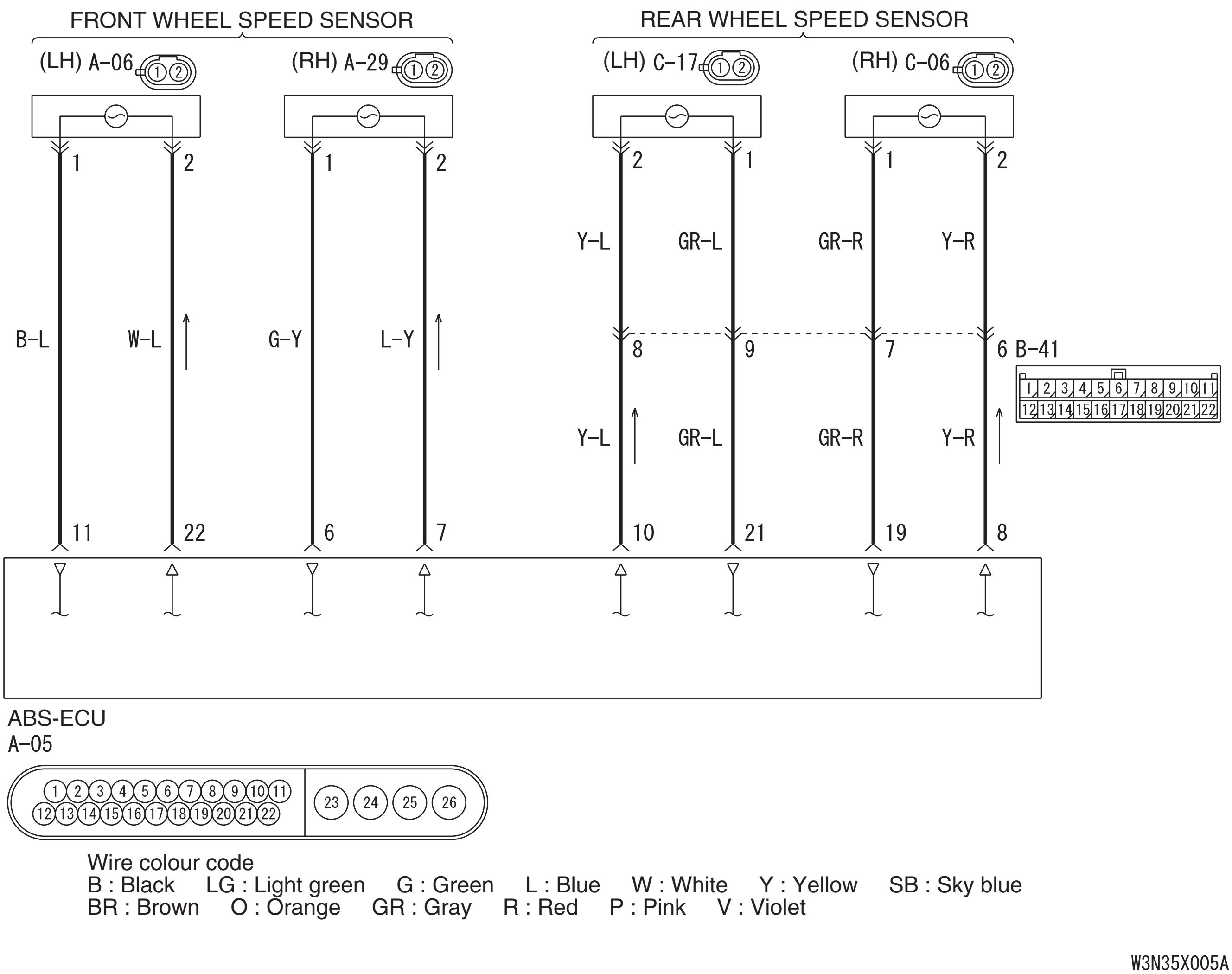
Q: Is code No.C1215 set?

YES : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to P.35B-78).

NO : The malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-13.

Code No.C1216: Wheel speed sensor (RL) system (sensor output failure)

Wheel Speed Sensor Circuit



OPERATION

The wheel speed sensor is a pulse generator. It consists of encoder (a plate on which north and south pole sides of the magnets are arranged alternately) for detecting wheel speed which rotates at the same speed as the road wheels. This sensor sends frequency pulse signals in proportion to wheel speed. The pulse signals, which the wheel speed sensor creates, are sent to the ABS-ECU. The ABS-ECU uses the frequency of the pulse signals to determine the wheel speed.

DIAGNOSIS CODE SET CONDITIONS

The ABS-ECU monitors the signals from the wheel speed sensors during driving. If the ECU detects malfunctions below, it sets the diagnosis code.

- Missing of wheel speed sensor signals
- When an abnormal wheel speed sensor signal is received
- When one of the wheel speed sensor signals (from the front, rear, right and left wheels) is significantly different from the others

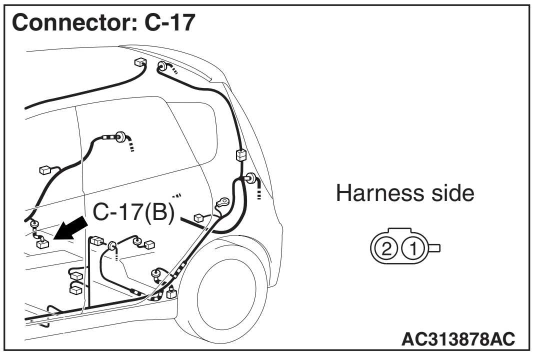
PROBABLE CAUSES

- Improperly installed wheel speed sensor
- Presence of dirt or other foreign particles on the encoder of the wheel speed sensor
- Deformed encoder of the wheel speed sensor
- Excessive gap between the wheel speed sensor and its encoder
- Damaged wiring harness or connector
- Malfunction of the wheel speed sensor
- Malfunction of the hydraulic unit (integrated with ABS-ECU)

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DIAGNOSTIC PROCEDURE

STEP 1. Connector check: C-17 rear left wheel speed sensor connector



Q: Is the check result normal?

YES : Go to Step 2.

NO : Repair the defective connector.

STEP 2. Remove the rear left wheel speed sensor and check it.

Refer to P.35B-81.

Q: Is the check result normal?

YES : Go to Step 3.

NO : Replace the rear left wheel speed sensor (Refer to P.35B-80).

STEP 3. Check the wheel bearing for excessive play.

Refer to GROUP 27, On-vehicle Service – Wheel Bearing Axial Play Check P.27-3.

Q: Is the check result normal?

YES : Go to Step 4.

NO : Replace the hub assembly (Refer to GROUP 27, Rear Axle Hub P.27-6).

STEP 4. Check the encoder for detecting wheel speed.

Check the encoder for presence of foreign objects or deformation.

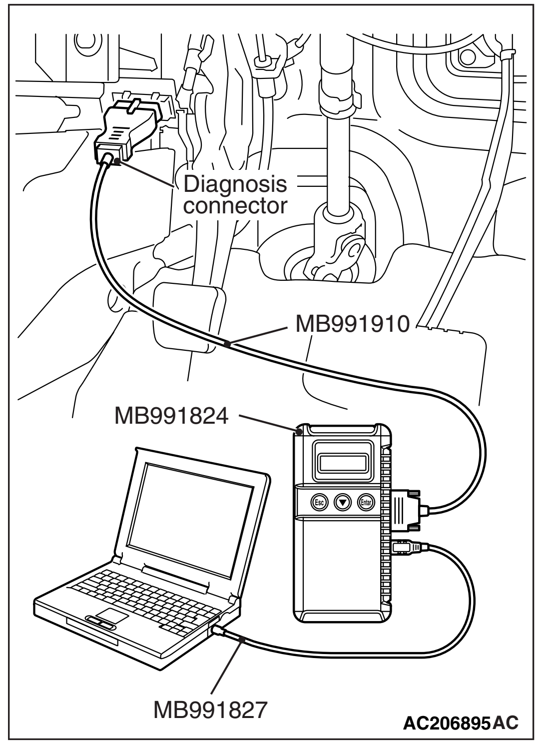
Q: Is the check result normal?

YES : Go to Step 5.

NO : If foreign objects are found, clean the encoder. If deformation is found, replace the hub (Refer to GROUP 27, Rear Axle Hub P.27-6).

STEP 5. Check whether the diagnosis code is reset.

⚠ CAUTION



Before connecting or disconnecting the M.U.T.-III, turn the ignition switch to the "LOCK" (OFF) position.

Check again if the diagnosis code is set.

(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.
(7) Disconnect M.U.T.-III.

Q: Is code No.C1216 set?

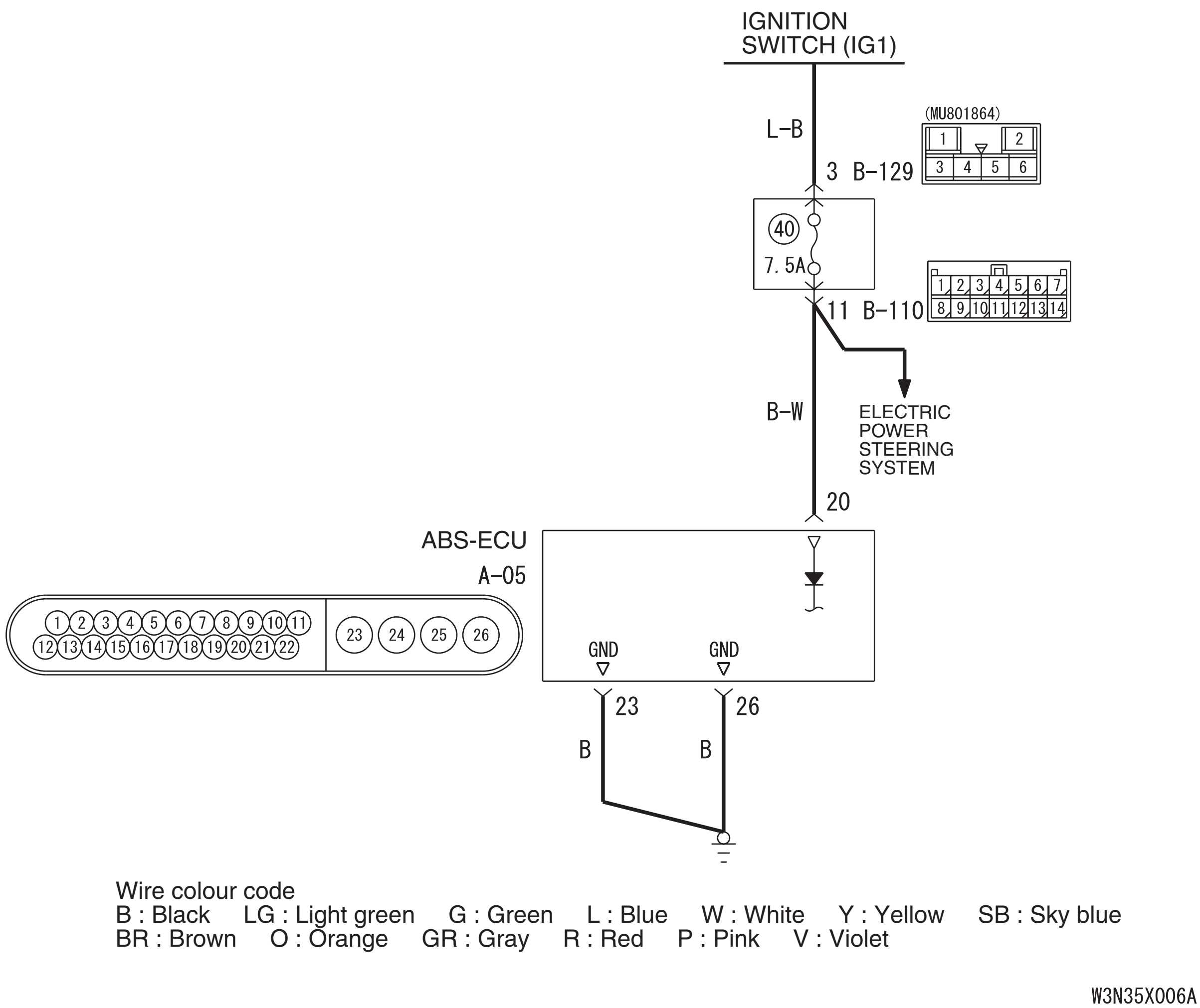
YES : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to P.35B-78).

NO : The malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-13.

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Code No.C1266: Motor system (stuck)

Power Supply Circuit



OPERATION

- The ABS-ECU contains the power supply circuit (terminal No.25) for the motor pump. The motor pump is energised by the pump relay, which is incorporated in the ABS-ECU.
- The pump relay, which is incorporated in the ABS-ECU, is always energising the motor pump unless the initial check is in progress when the ignition switch is turned on, or the recurrent system check is in progress.

DIAGNOSIS CODE SET CONDITIONS

These diagnosis codes will be set under the cases below.

- The ABS-ECU monitors the voltage, which is created by the pump motor coasting, after the motor relay is turned off. If the voltage continues only for too short period, the ECU determines that the pump motor is not running smoothly (i.e. motor seizure), and sets this diagnosis code.

PROBABLE CAUSES

The most likely causes for these diagnosis codes to set are:

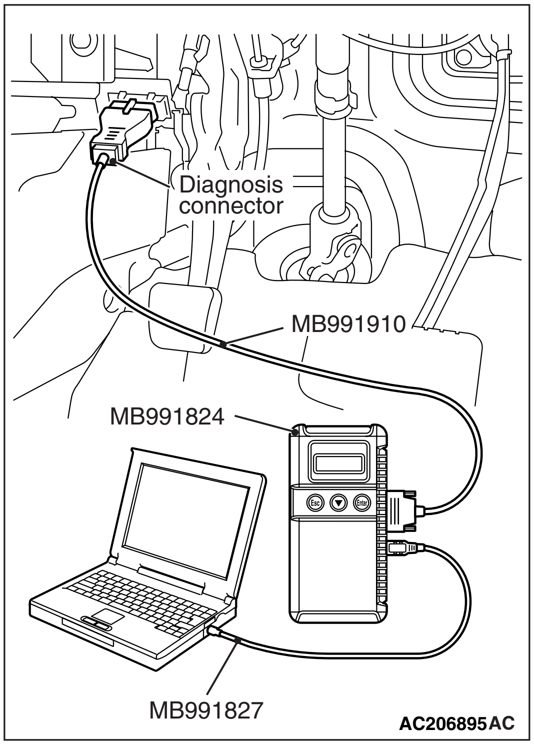
- Damaged wiring harness or connector
- Malfunction of the hydraulic unit (integrated with ABS-ECU)

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DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III diagnosis code

⚠ CAUTION



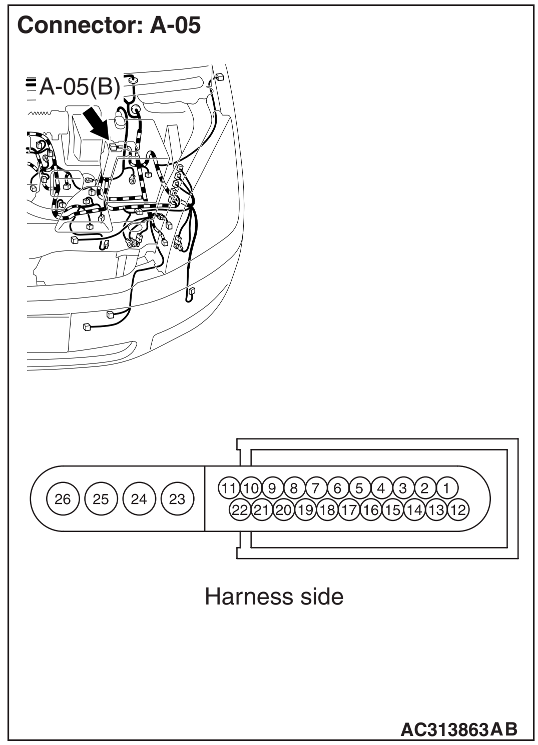
Before connecting or disconnecting the M.U.T.-III, turn the ignition switch to the "LOCK" (OFF) position.

(1) Turn the ignition switch to the "ON" position.
(2) Check if the diagnosis code is set.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.C1273 set?

YES : . Carry out the troubleshooting for diagnosis code C1273 (Refer to P.35B-38).
NO : . Go to Step 2.

STEP 2. Check ABS-ECU connector A-05 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

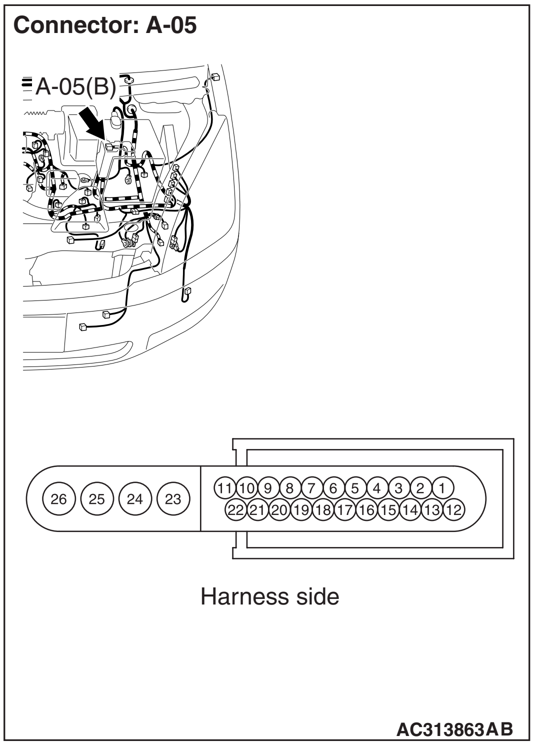


Q: Is the check result normal?

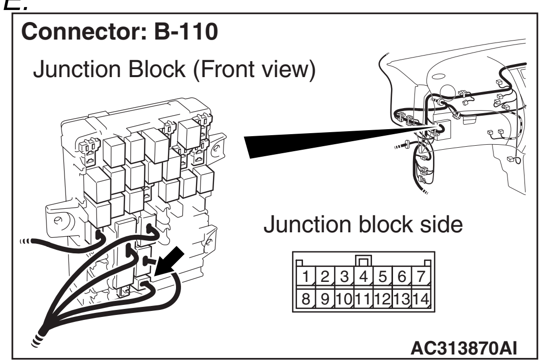
YES : Go to Step 3.
NO : Repair or replace the damaged component(s). Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – Connector Inspection Service Points P.00-11.

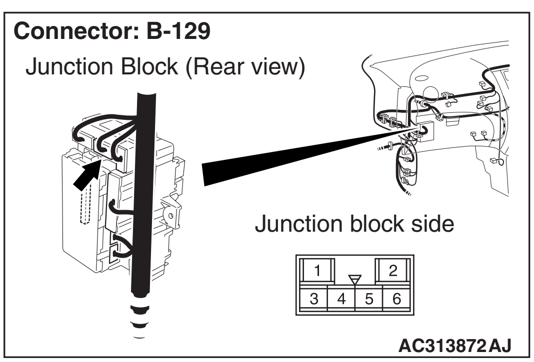
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STEP 3. Check the harness wire between the ABS-ECU connector A-05 terminal 20 and ignition switch (IG1).



NOTE:





After inspecting connector B-129 and B-110, inspect the wire. If connector B-129 or B-110 is damaged, repair or replace it.

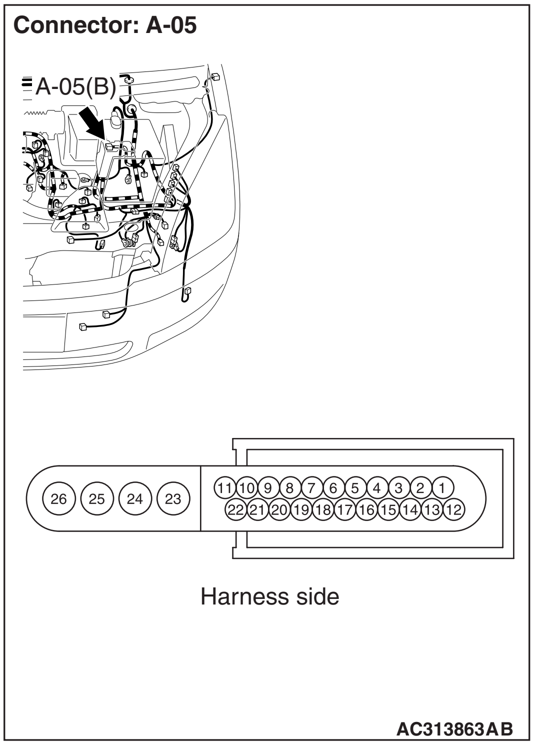
Q: Is the harness wire between the ABS-ECU connector A-05 terminal 20 and ignition switch (IG1) damaged?

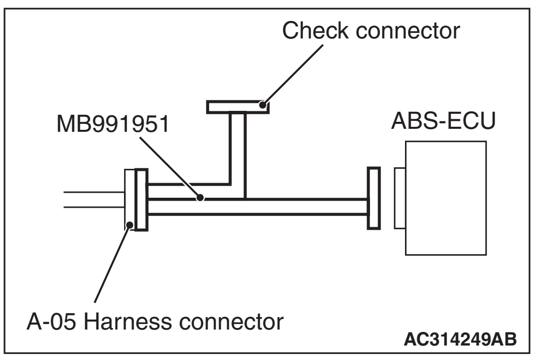
YES : Repair the harness wire and then go to Step 6.

NO : Go to Step 4.

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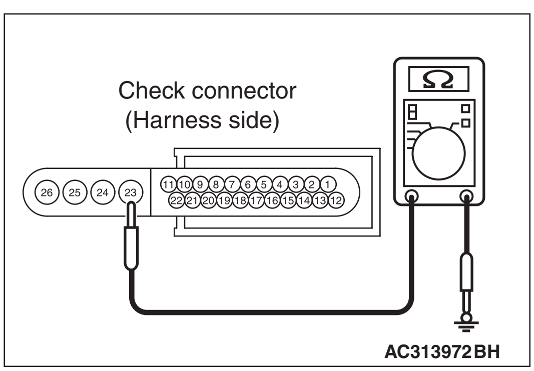
STEP 4. Resistance measurement at ABS-ECU connector A-05.





(1) Disconnect the connector A-05, and connect special tool ABS Check Harness (MB991951) to the wiring harness-side connector.

NOTE: Do not connect special tool ABS Check Harness (MB991951) to the ABS-ECU.



(2) Measure the resistance between terminal 23 and earth.

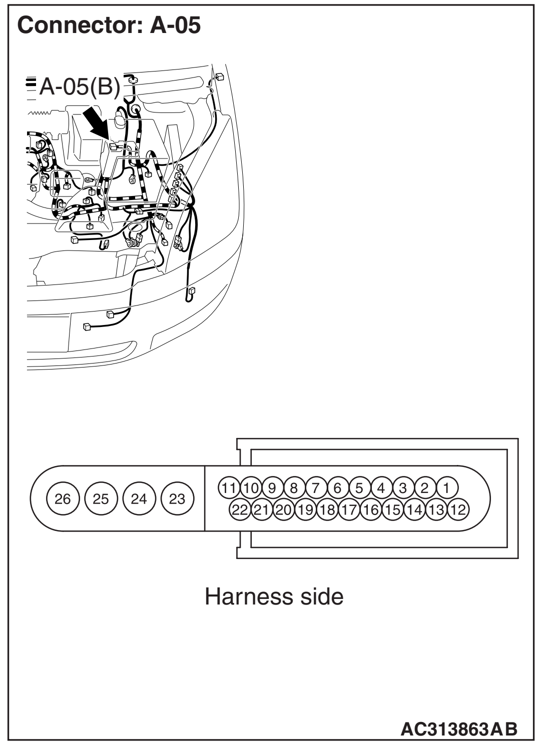
OK: 5 Ω or less

Q: Is the result normal?

YES : Go to Step 6.

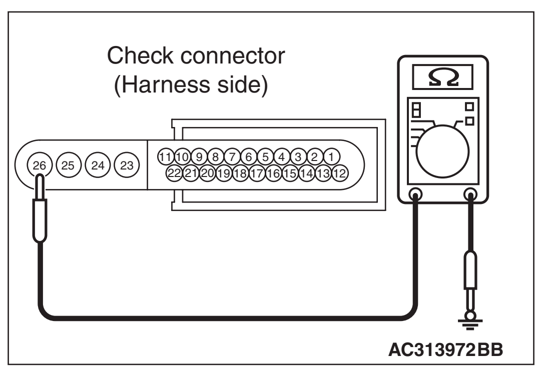
NO : Go to Step 5.

STEP 5. Resistance measurement at ABS-ECU connector A-05.



(1) Disconnect the connector A-05, and connect special tool ABS Check Harness (MB991951) to the wiring harness-side connector.

NOTE: Do not connect special tool ABS Check Harness (MB991951) to the ABS-ECU.



(2) Measure the resistance between terminal 26 and earth.

OK: 5 Ω or less

Q: Is the result normal?

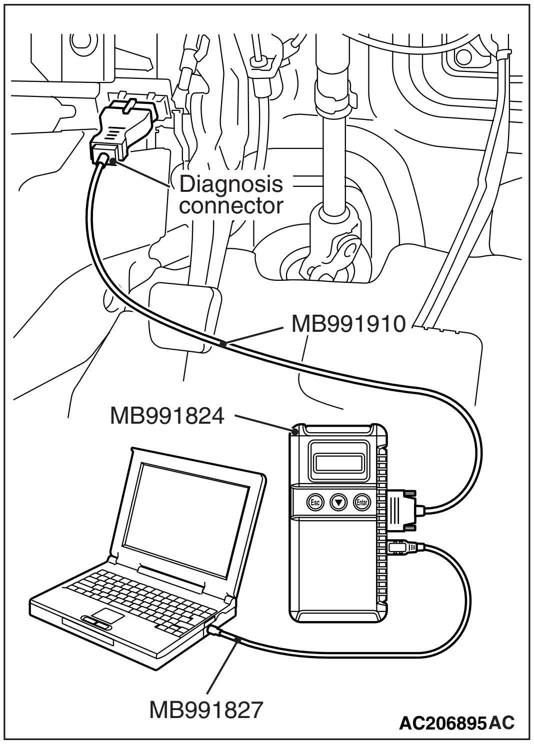
YES : Go to Step 6.

NO : Repair the wiring harness between the ABS-ECU and body earth.

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STEP 6. Check whether the diagnosis code is reset.

⚠ CAUTION



Before connecting or disconnecting the M.U.T.-III, turn the ignition switch to the "LOCK" (OFF) position.

(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.
(7) Disconnect M.U.T.-III.

Q: Is code No.C1266 set?

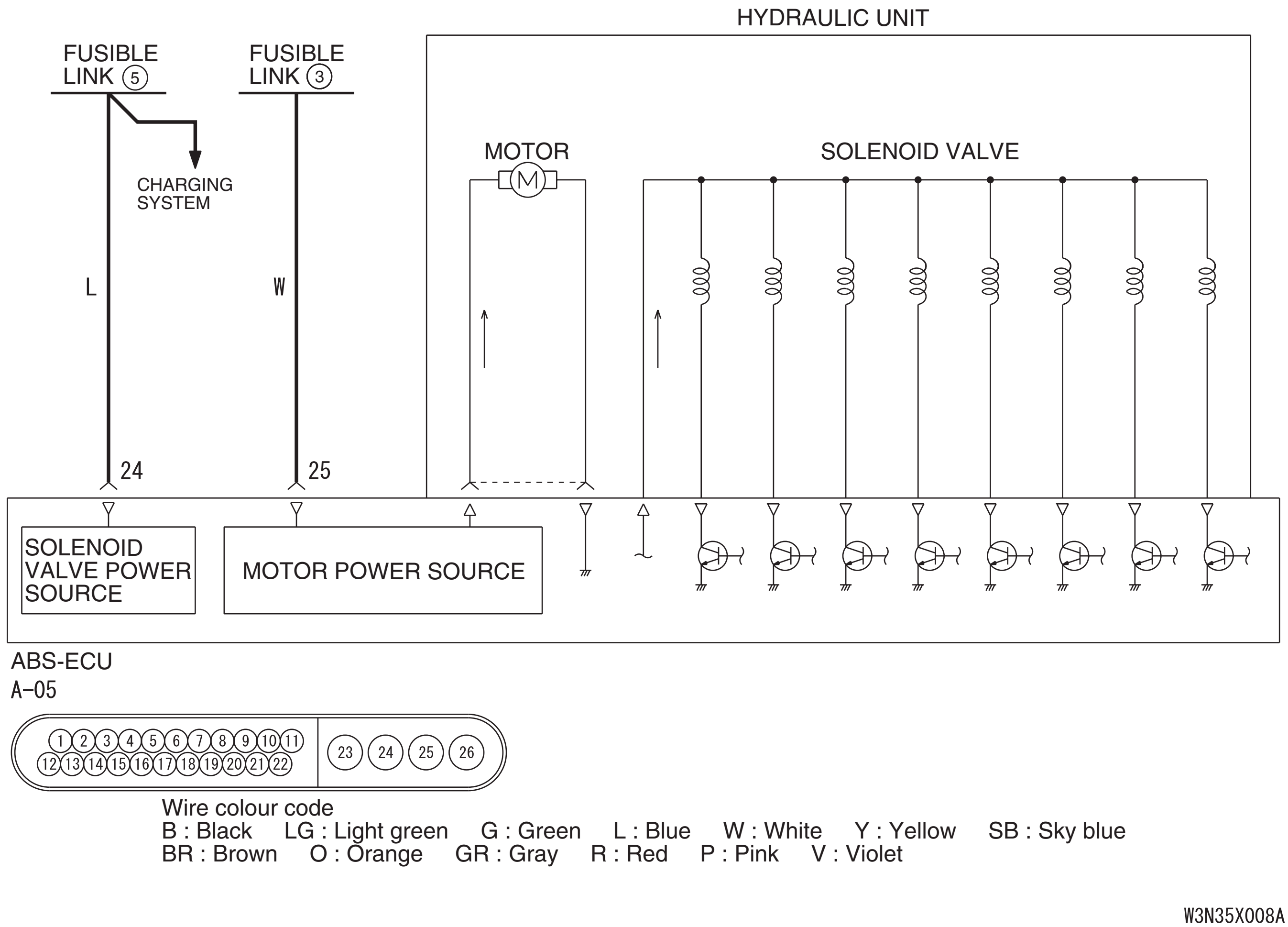
YES : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to P.35B-78).

NO : The malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-13.

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Code No.C1273: Motor relay stuck off

Hydraulic Unit (Motor and Solenoid Valve) Circuit



OPERATION

- The ABS-ECU contains the power supply circuit (terminal No.25) for the motor pump. The motor pump is energised by the pump relay, which is incorporated in the ABS-ECU.
- The pump relay, which is incorporated in the ABS-ECU, is always energising the motor pump unless the initial check is in progress when the ignition switch is turned on, or the recurrent system check is in progress.

DIAGNOSIS CODE SET CONDITIONS

These diagnosis codes will be set under the cases below.

- If the voltage, which is created by the pump motor, is abnormal after the motor relay is turned on, the ECU determines that the motor relay is stuck off, and sets this diagnosis code.

PROBABLE CAUSES

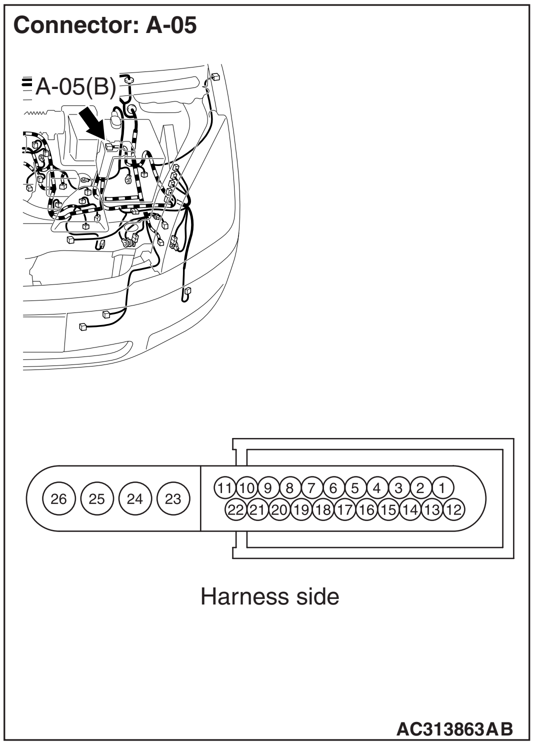
The most likely causes for these diagnosis codes to set are:

- Damaged wiring harness or connector
- Malfunction of the hydraulic unit (integrated with ABS-ECU)

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DIAGNOSIS PROCEDURE

STEP 1. Check ABS-ECU connector A-05 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

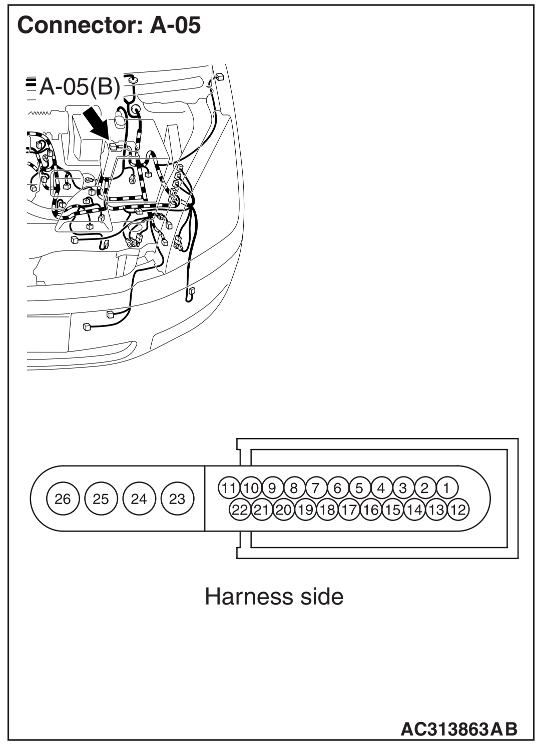


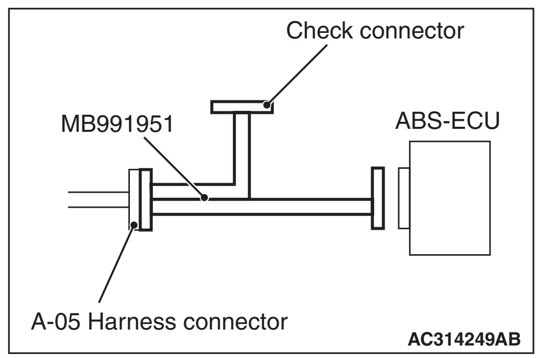
Q: Is the check result normal?

YES : Go to Step 2.

NO : Repair or replace the damaged component(s). Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – Connector Inspection Service Points P.00-11.

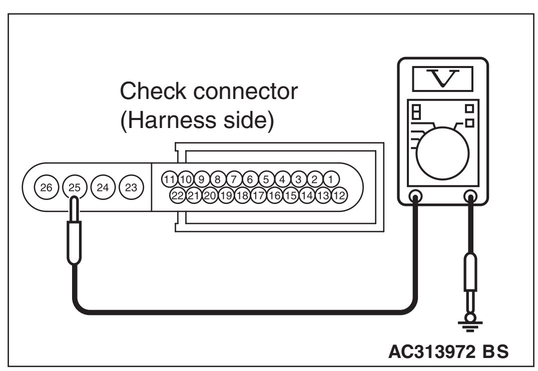
STEP 2. Voltage measurement at ABS-ECU connector A-05.





(1) Disconnect the connector A-05, and connect special tool ABS Check Harness (MB991951) to the wiring harness-side connector.

NOTE: Do not connect special tool ABS Check Harness (MB991951) to the ABS-ECU.



(2) Measure the voltage between terminal 25 and earth.

OK: System voltage

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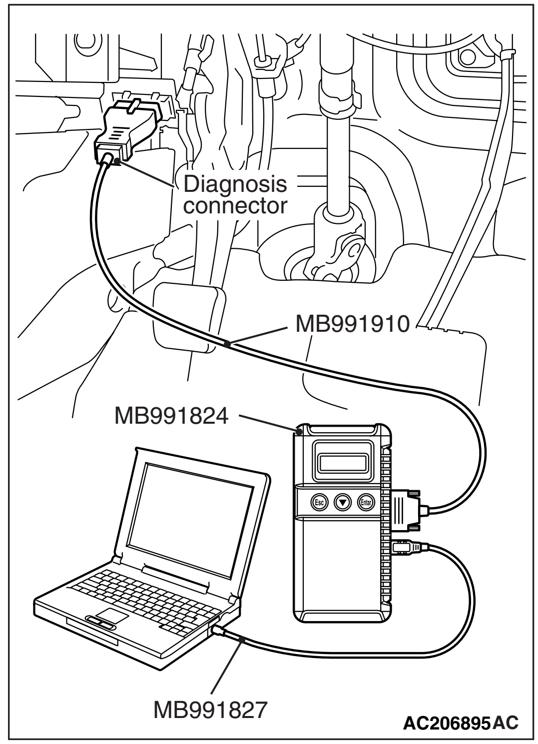
Q: Is the result normal?

YES : Go to Step 3.

NO : Repair the wiring harness between the ABS-ECU and fusible link No.3.

STEP 3. Check whether the diagnosis code is reset.

⚠ CAUTION



Before connecting or disconnecting the M.U.T.-III, turn the ignition switch to the "LOCK" (OFF) position.

(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.
(7) Disconnect M.U.T.-III.

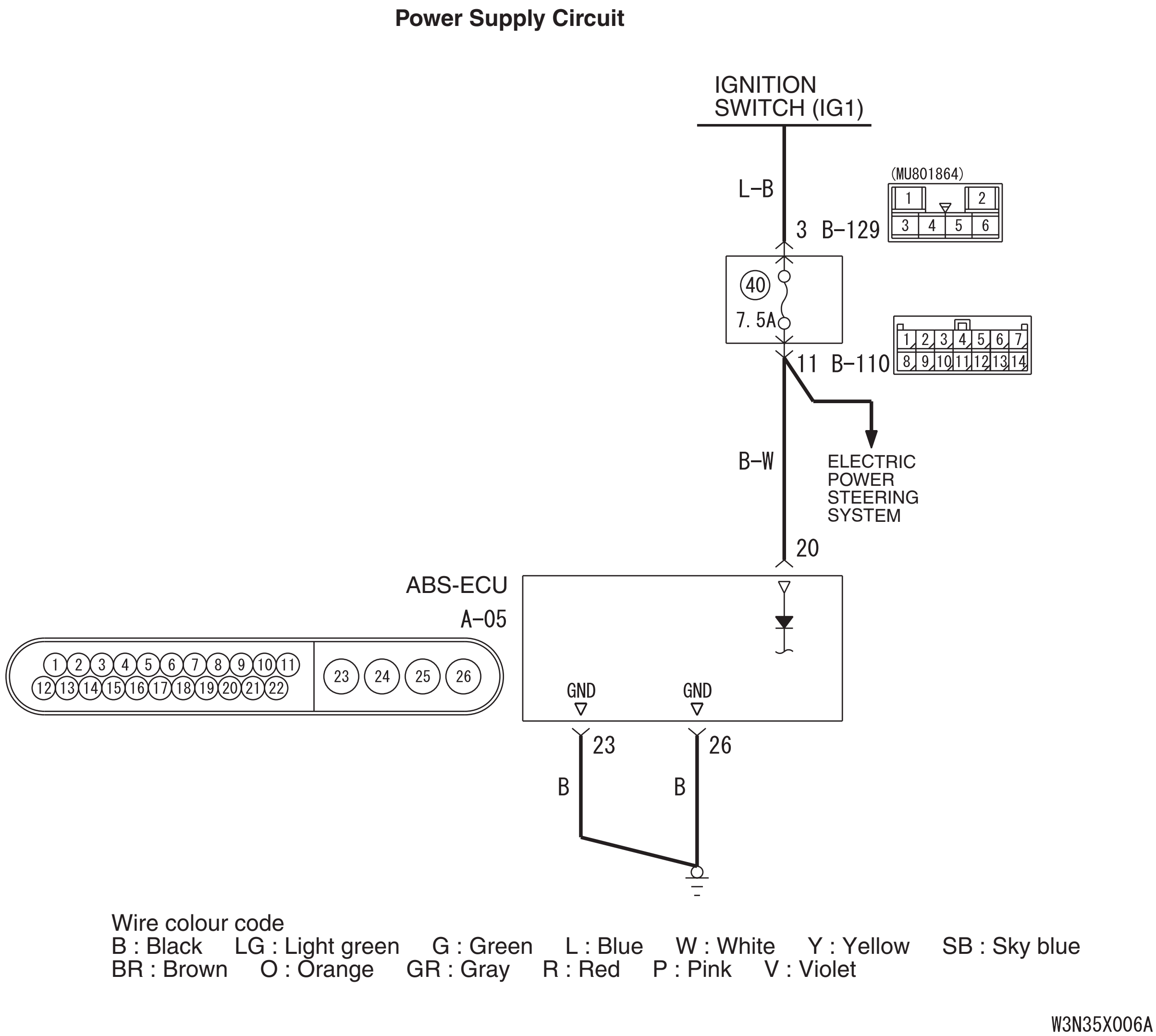
Q: Is code No.C1273 set?

YES : Replace the hydraulic unit(integrated with ABS-ECU) (Refer to P.35B-78).

NO : The malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-13.

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Code No.C1274: Motor relay stuck on



OPERATION

- The ABS-ECU contains the power supply circuit (terminal No.25) for the motor pump. The motor pump is energised by the pump relay, which is incorporated in the ABS-ECU.
- The pump relay, which is incorporated in the ABS-ECU, is always energising the motor pump unless the initial check is in progress when the ignition switch is turned on, or the recurrent system check is in progress.

DIAGNOSIS CODE SET CONDITIONS

These diagnosis codes will be set under the cases below.

- If the voltage, which is created by the pump motor, is abnormal after the motor relay is turned off, the ECU determines that the motor relay is stuck on, and sets this diagnosis code.

PROBABLE CAUSES

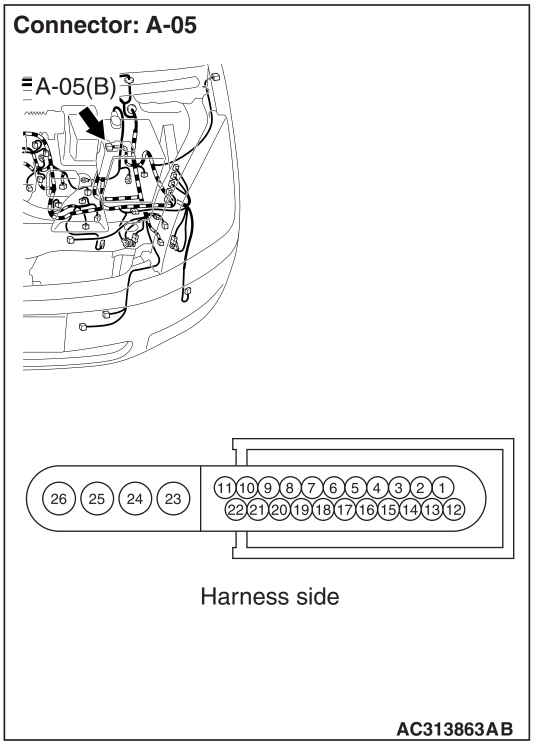
The most likely causes for these diagnosis codes to set are:

- Damaged wiring harness or connector
- Malfunction of the hydraulic unit (integrated with ABS-ECU)

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DIAGNOSIS PROCEDURE

STEP 1. Check ABS-ECU connector A-05 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

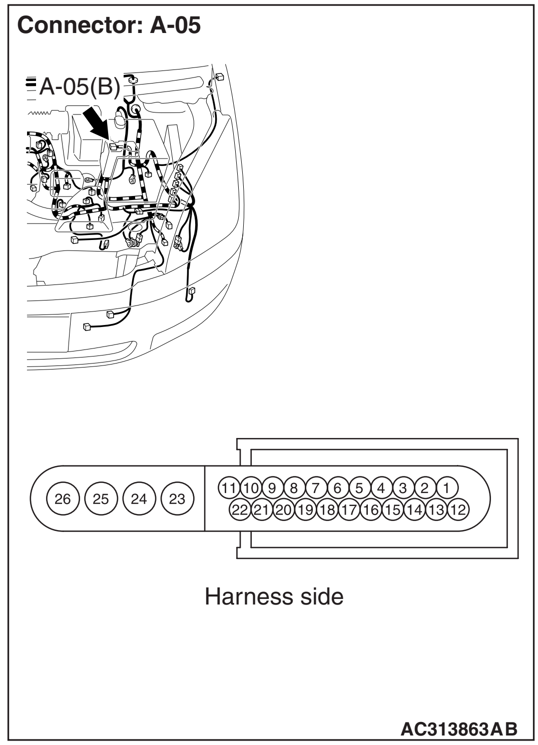


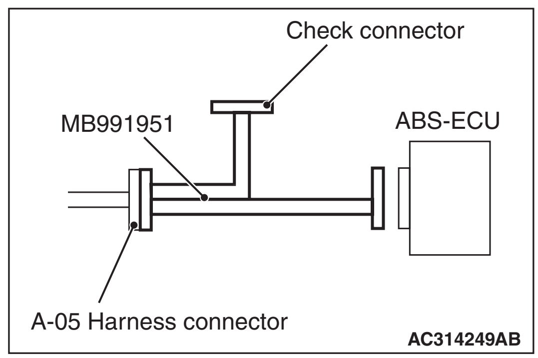
Q: Is the check result normal?

YES : Go to Step 2.

NO : Repair or replace the damaged component(s). Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – Connector Inspection Service Points P.00-11.

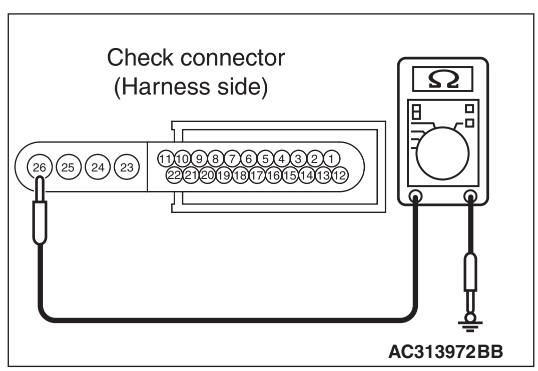
STEP 2. Resistance measurement at ABS-ECU connector A-05.





(1) Disconnect the connector A-05, and connect special tool ABS Check Harness (MB991951) to the wiring harness-side connector.

NOTE: Do not connect special tool ABS Check Harness (MB991951) to the ABS-ECU.



(2) Measure the resistance between terminal 26 and earth.

OK: 5 Ω or less

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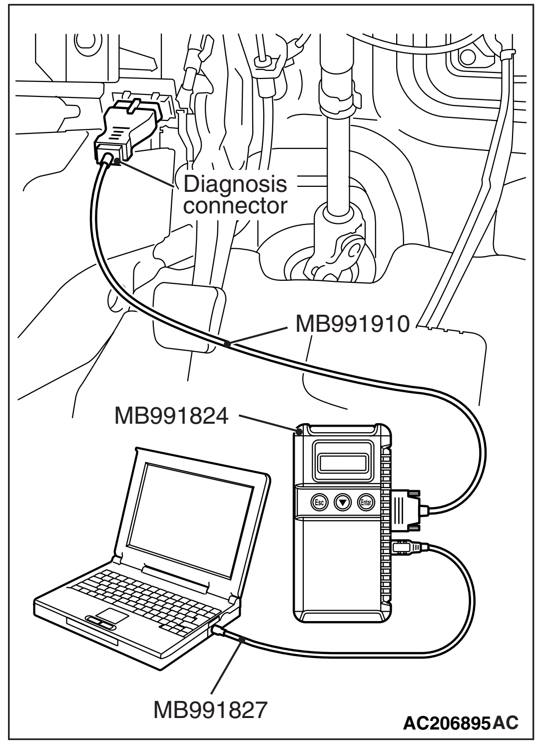
Q: Is the result normal?

YES : Go to Step 3.

NO : Repair the wiring harness between the ABS-ECU and the battery.

STEP 3. Check whether the diagnosis code is reset.

⚠ CAUTION



Before connecting or disconnecting the M.U.T.-III, turn the ignition switch to the "LOCK" (OFF) position.

(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.
(7) Disconnect M.U.T.-III.

Q: Is code No.C1274 set?

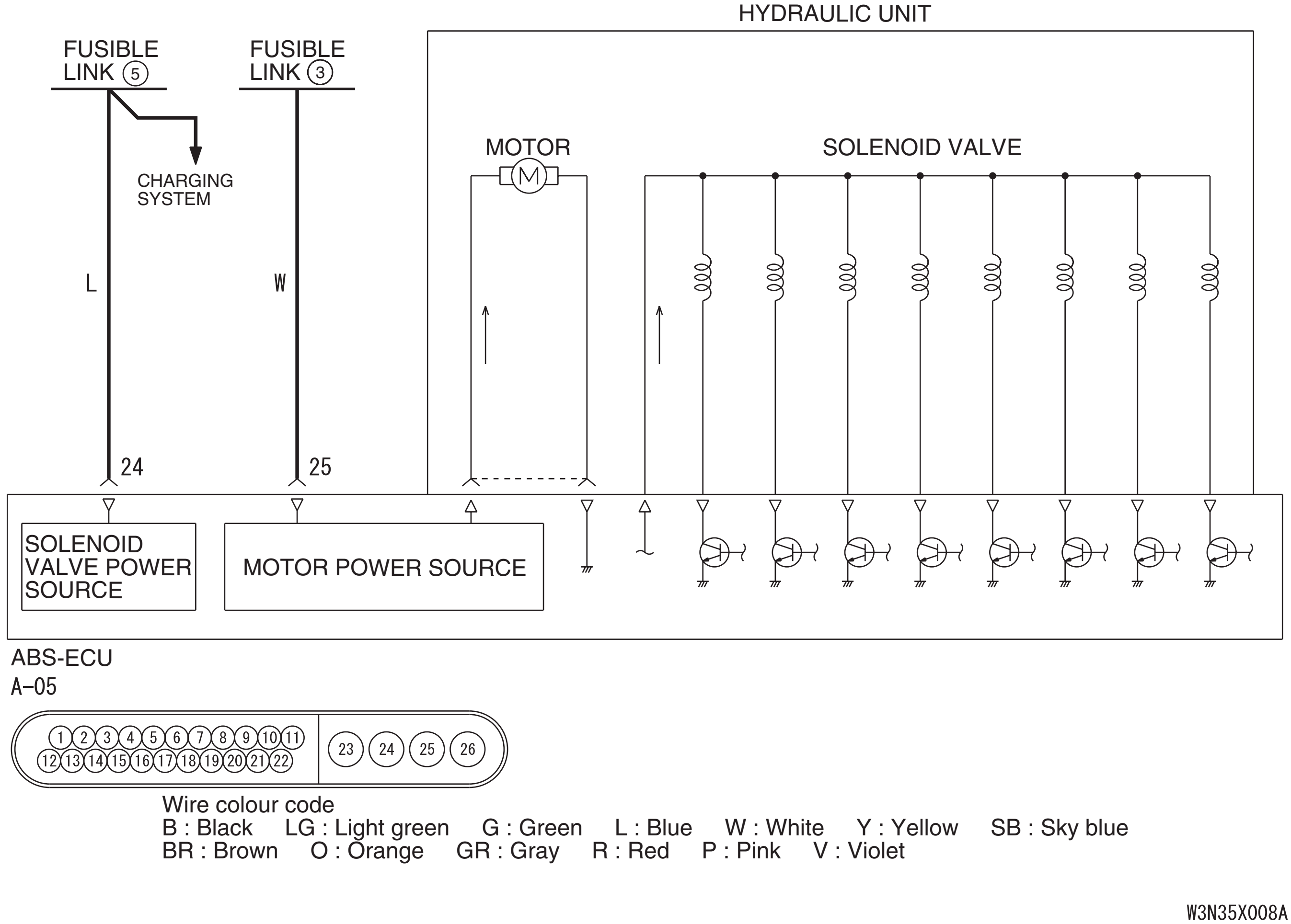
YES : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to P.35B-78).

NO : The malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-13.

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Code No.C1276: Valve relay system

Hydraulic Unit (Motor and Solenoid Valve) Circuit



OPERATION

- The ABS-ECU contains the power supply circuit (terminal No.24) for the solenoid valve. The solenoid valve is energised by the valve relay, which is incorporated in the ABS-ECU.
- The valve relay, which is incorporated in the ABS-ECU, is always energising the solenoid valve unless the initial check is in progress when the ignition switch is turned on, or the recurrent system check is in progress.

DIAGNOSIS CODE SET CONDITIONS

These diagnosis codes will be set under the cases below.

- The ABS-ECU monitors the power supply voltage to the solenoid valve. If the voltage is lower than the predetermined value, the ECU sets this diagnosis code as a failure in the valve relay circuit.

PROBABLE CAUSES

The most likely causes for these diagnosis codes to set are:

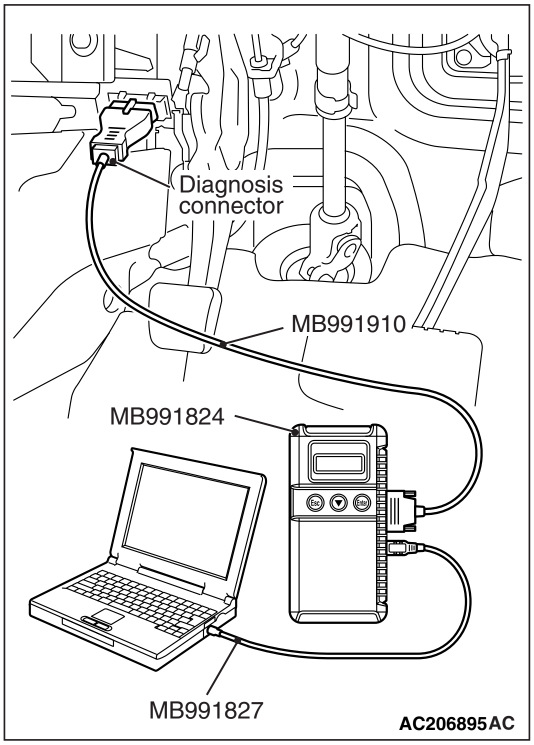
- Damaged wiring harness or connector
- Malfunction of the hydraulic unit (integrated with ABS-ECU)

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DIAGNOSIS PROCEDURE

M.U.T.-III diagnosis code

⚠ CAUTION



Before connecting or disconnecting the M.U.T.-III, turn the ignition switch to the "LOCK" (OFF) position.

(1) Turn the ignition switch to the "ON" position.
(2) Check if the diagnosis code is set.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Disconnect M.U.T.-III.

Q: Is code No.C1278 also set?

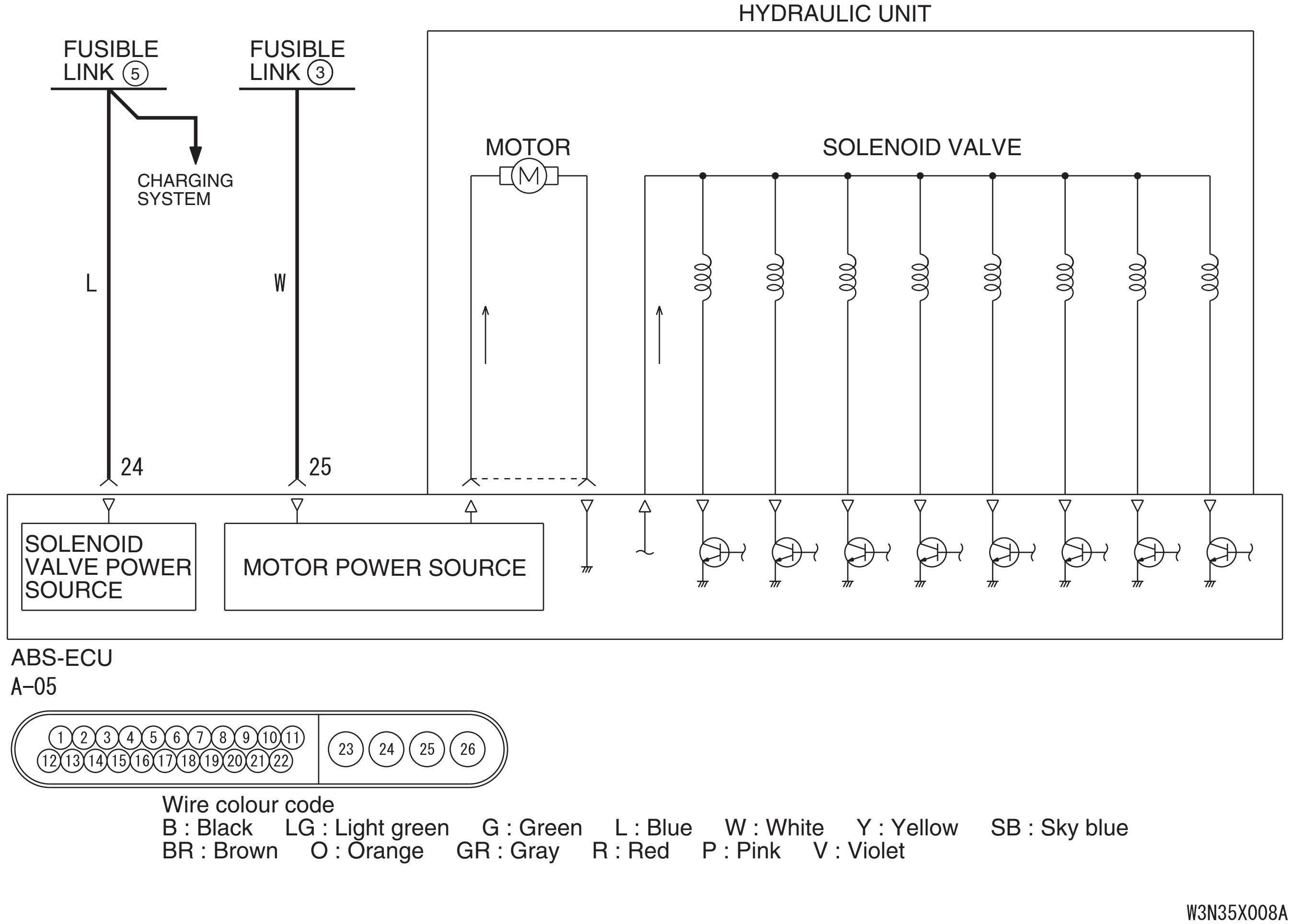
YES : Carry out the troubleshooting for diagnosis code No.C1278 (Refer to P.35B-46).

NO : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to P.35B-78).

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Code No.C1278: Valve relay system stuck off

Hydraulic Unit (Motor and Solenoid Valve) Circuit



OPERATION

- The ABS-ECU contains the power supply circuit (terminal No.24) for the solenoid valve. The solenoid valve is energised by the valve relay, which is incorporated in the ABS-ECU.
- The valve relay, which is incorporated in the ABS-ECU, is always energising the solenoid valve unless the initial check is in progress when the ignition switch is turned on, or the recurrent system check is in progress.

DIAGNOSIS CODE SET CONDITIONS

- The ABS-ECU monitors the power supply voltage to the solenoid valve. If the voltage is lower than the predetermined value, the ECU sets this diagnosis code as a failure in the valve relay circuit.

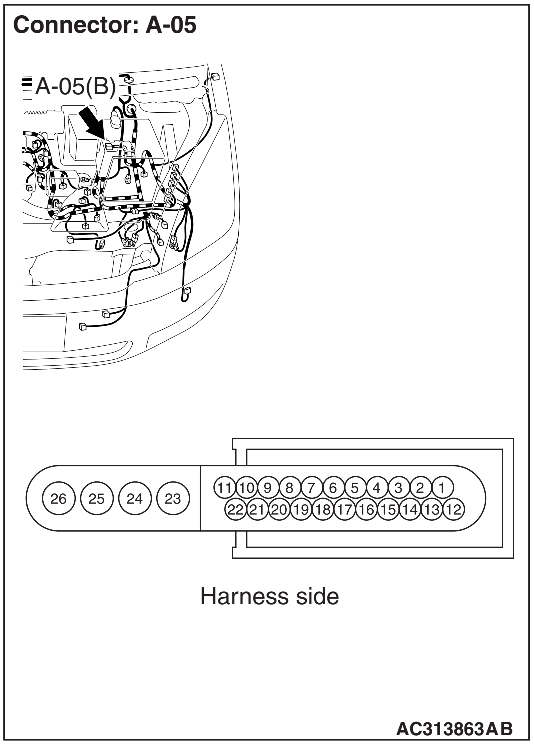
PROBABLE CAUSES

The most likely causes for these diagnosis codes to set are:

- Damaged wiring harness or connector
- Malfunction of the hydraulic unit (integrated with ABS-ECU)

DIAGNOSIS PROCEDURE

STEP 1. Check ABS-ECU connector A-05 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

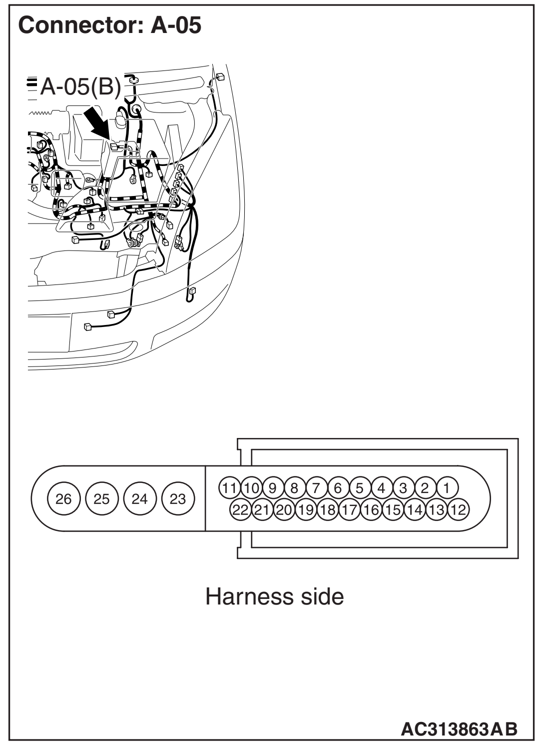


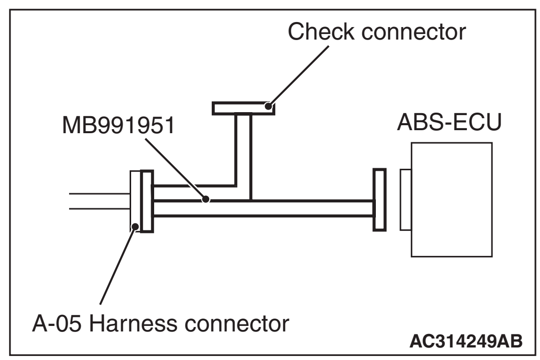
Q: Is the check result normal?

YES : Go to Step 2.

NO : Repair or replace the damaged component(s). Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – Connector Inspection Service Points P.00-11.

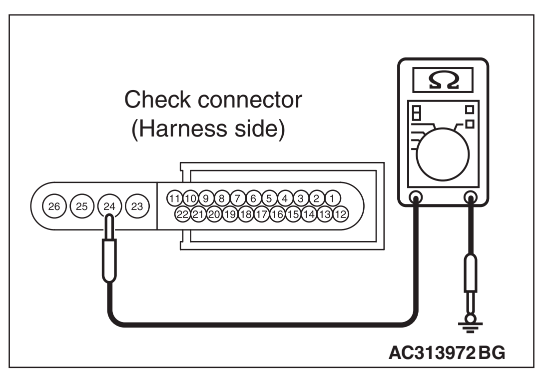
STEP 2. Resistance measurement at ABS-ECU connector A-05.





(1) Disconnect the connector A-05, and connect special tool ABS Check Harness (MB991951) to the wiring harness-side connector.

NOTE: Do not connect special tool ABS Check Harness (MB991951) to the ABS-ECU.



(2) Measure the resistance between terminal 24 and battery terminal.

OK: 10 Ω or less

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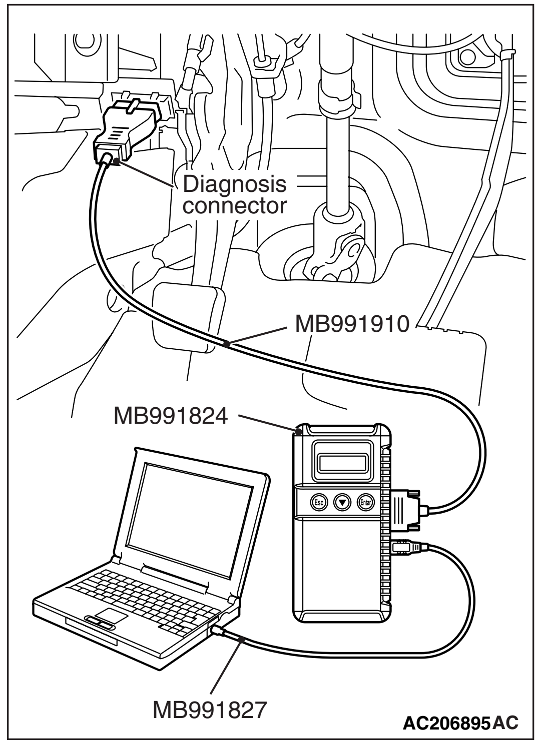
Q: Is the result normal?

YES : Go to Step 3.

NO : Repair the wiring harness between the ABS-ECU and the battery.

STEP 3. Check whether the diagnosis code is reset.

⚠ CAUTION



Before connecting or disconnecting the M.U.T.-III, turn the ignition switch to the "LOCK" (OFF) position.

(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.
(7) Disconnect M.U.T.-III.

Q: Is code No.C1278 set?

YES : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to P.35B-78).

NO : The malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-13.

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Code No.C1860: ABS-ECU power supply system (abnormal voltage increase)

OPERATION

The ABS-ECU is energized by the ignition switch (IG1) through multi-purpose fuse 40 and the ABS-ECU terminal 20.

DIAGNOSIS CODE SET CONDITIONS

This diagnosis code will be set if the battery voltage increases to 16.9 V or more while the engine is running.

PROBABLE CAUSES

- Defective battery
- Damaged wiring harness or connector
- Malfunction of the hydraulic unit (integrated with ABS-ECU)
- Charging system failed

DIAGNOSIS PROCEDURE

STEP 1. Check the battery and charging system.

Check the battery and charging system.

- Ignition switch: ON
- Engine: Start
- Engine speed: Approximately 2500 rpm

Measure the voltage between the battery terminals.

OK: 16 V or less

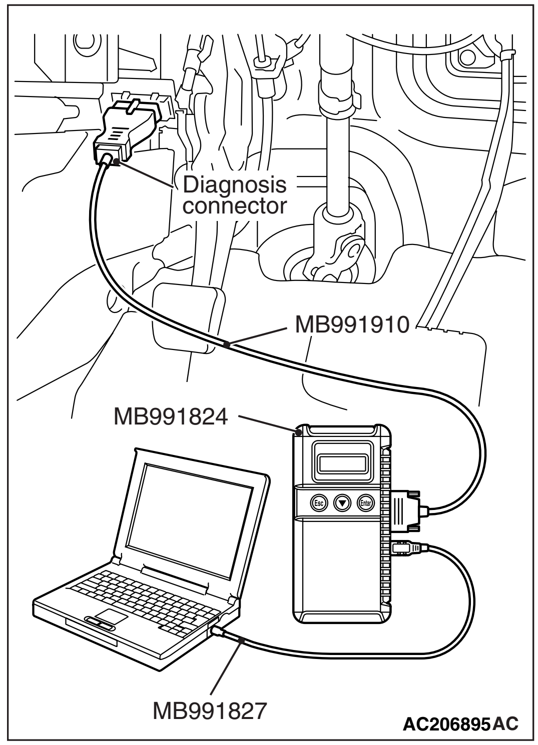
Q: Is the check result normal?

YES : Go to Step 2.

NO : Inspection, repair or replace the charging system component(s).

STEP 2. Check whether the diagnosis code is reset.

⚠ CAUTION



Before connecting or disconnecting the M.U.T.-III, turn the ignition switch to the "LOCK" (OFF) position.

Check again if the diagnosis code is set.

(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.
(7) Disconnect M.U.T.-III.

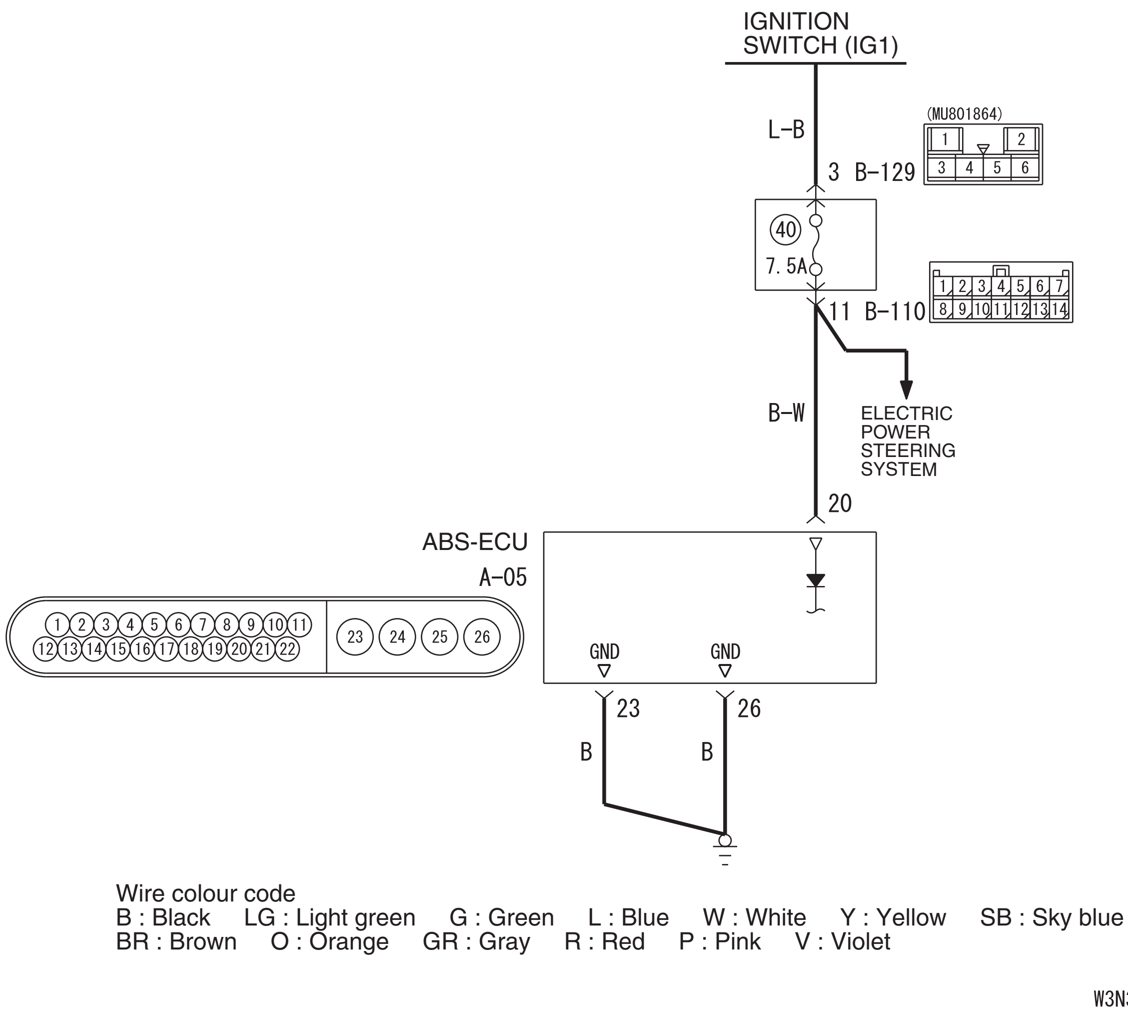
Q: Is code No.C1860 set?

YES : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to P.35B-78).

NO : The malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-13.

Code No.C1861: ABS-ECU power supply system (abnormal voltage drop)

Power Supply Circuit



OPERATION

The ABS-ECU is energized by the ignition switch (IG1) through multi-purpose fuse 40 and the ABS-ECU terminal 20.

DIAGNOSIS CODE SET CONDITIONS

If the vehicle speed exceeds 6 km/h when the battery voltage is 7.6 V or less, the ECU will illuminate the charge warning light and set this diagnosis code.

NOTE: If the battery voltage is less than 9.6 V or 9.3 V (while the ABS is activating), the ECU will illuminate the charge warning lamp, but will not set diagnosis code C1861. If the vehicle speed does not exceed 6 km/h when the battery voltage is 7.6 V or less, the ECU will illuminate the charge warning lamp, but will not set diagnosis code C1861.

PROBABLE CAUSES

- Defective battery
- Damaged wiring harness or connector
- Malfunction of the hydraulic unit (integrated with ABS-ECU)
- Charging system failed

DIAGNOSIS

STEP 1. Check the battery and charging system.

Check the battery and charging system.

- Ignition switch: ON
- Engine: Start
- Engine speed: Approximately 2500 rpm

Measure the voltage between the battery terminals.

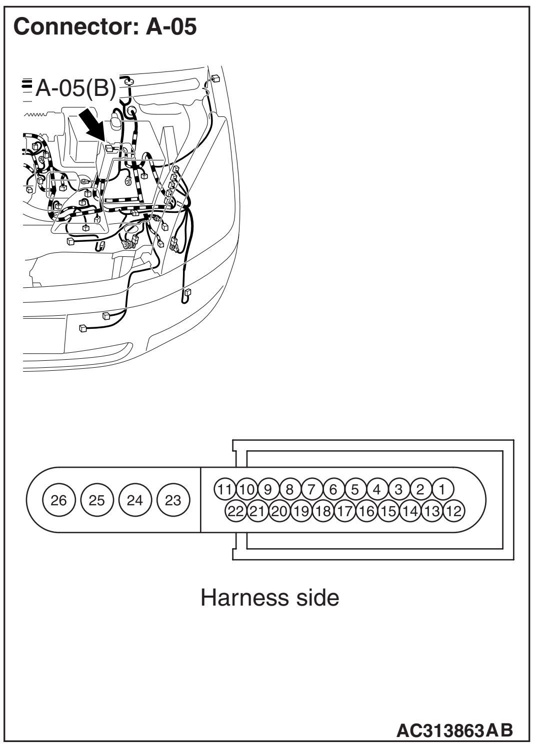
OK: 16 V or less

Q: Is the check result normal?

YES : Go to Step 2.

NO : Inspection, repair or replace the charging system component(s).

STEP 2. Check the ACS-ECU connector A-05.



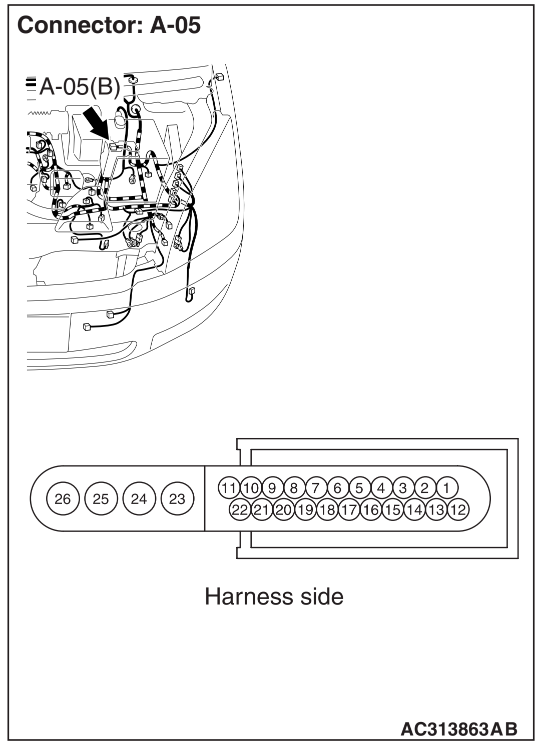
Check the connectors, for loose, corroded or damaged terminals, or terminals pushed back in the connector.

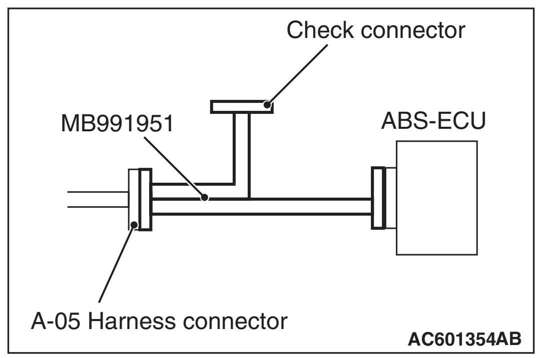
Q: Is the check result normal?

YES : Go to Step 3.

NO : Repair or replace the damaged component(s). Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – Connector Inspection Service Points P.00-11.

STEP 3. Voltage measurement at ABS-ECU connector A-05.





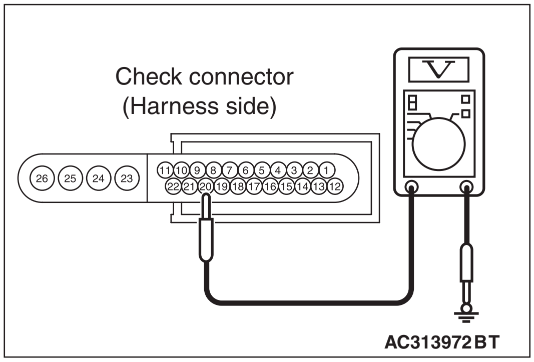
(1) Disconnect the connector A-05, and connect special tool ABS Check Harness (MB991951) to the wiring harness-side connector.

NOTE: Connect special tool ABS Check Harness (MB991951) to the ABS-ECU.

(2) Turn the ignition switch to the "ON" position.

(3) Start the engine.

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(4) Measure the voltage between terminal 20 and earth.

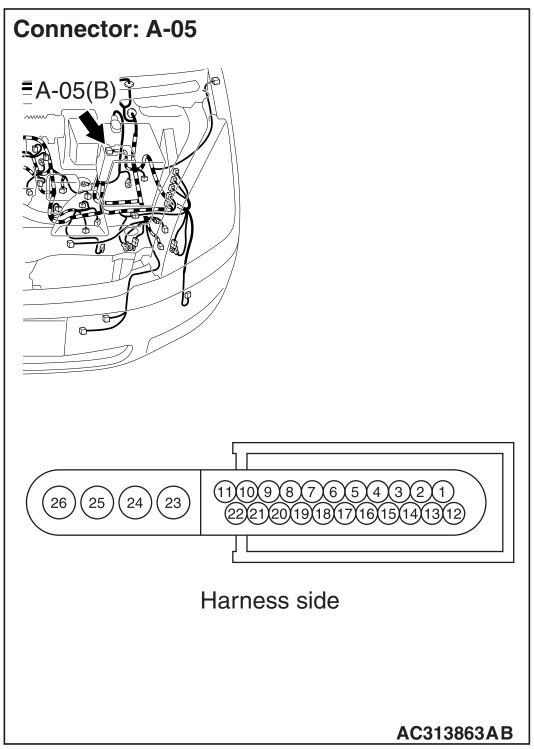
OK: 10 V or more

Q: Is the check result normal?

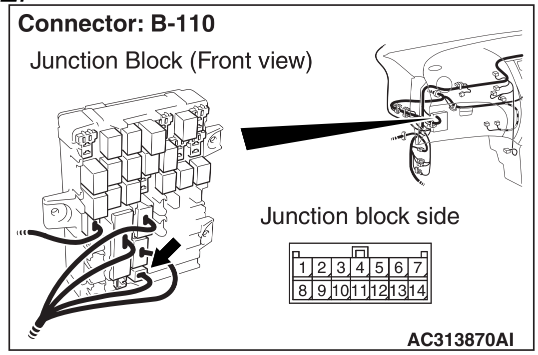
YES : Go to Step 5.

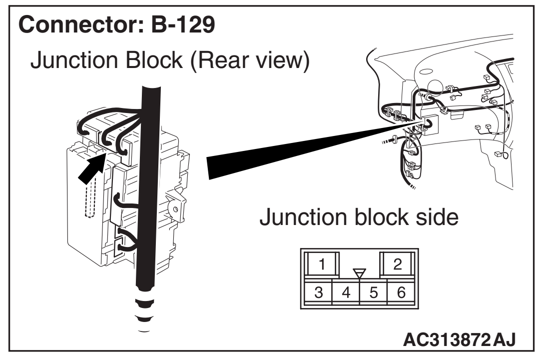
NO : Go to Step 4.

STEP 4. Check the harness wire between the ABS-ECU connector A-05 terminal 20 and ignition switch (IG1).



NOTE:





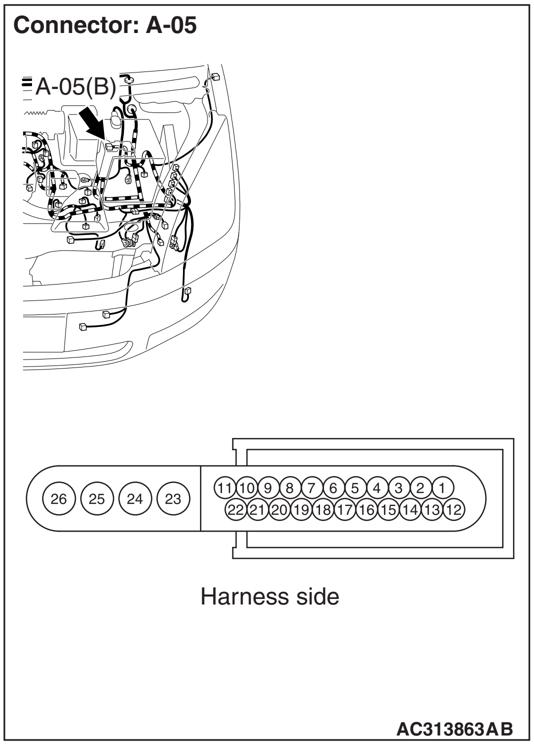
After inspecting connector B-110 and B-129, inspect the wire. If connector B-110 or B-129 is damaged, repair or replace it.

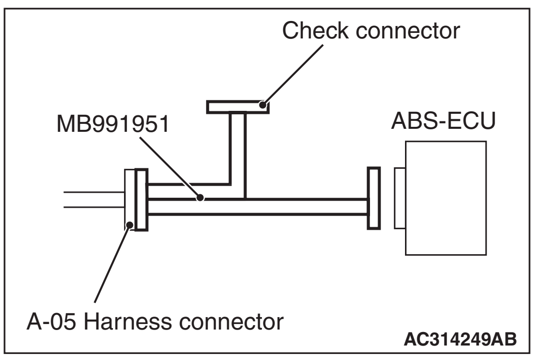
Q: Is the harness wire between the ABS-ECU connector A-05 terminal 20 and ignition switch (IG1) damaged?

YES : Repair the harness wire and then go to Step 7.

NO : Go to Step 5.

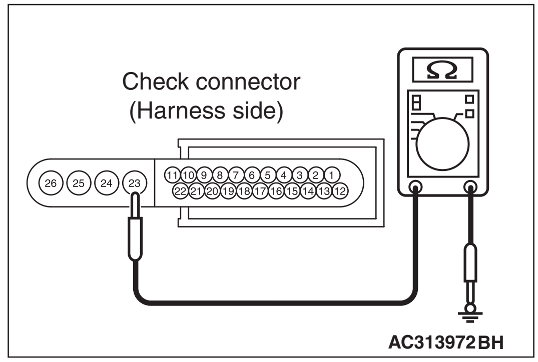
STEP 5. Measure the resistance at ABS-ECU connector A-05.





(1) Disconnect the connector A-05, and connect special tool ABS Check Harness (MB991951) to the wiring harness-side connector.

NOTE: Do not connect special tool ABS Check Harness (MB991951) to the ABS-ECU.



(2) Measure the resistance between terminal 23 and earth.

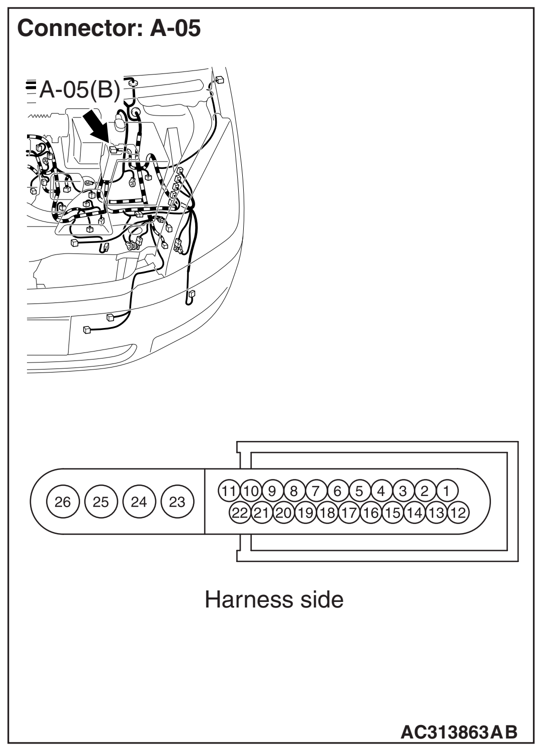
OK: 5 Ω or less

Q: Is the result normal?

YES : Go to Step 7.

NO : Go to Step 6.

STEP 6. Check the harness wire between the ABS-ECU connector A-05 terminal 23 and body earth.



Q: Is the harness wire between the ABS-ECU connector A-05 terminal 23 and body earth damaged?

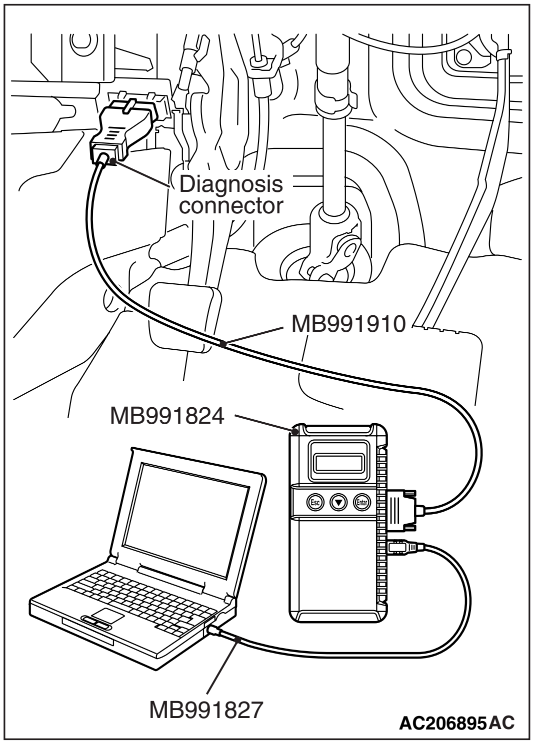
YES : Repair the harness wire and then go to Step 7.

NO : Go to Step 7.

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STEP 7. Check whether the diagnosis code is reset.

⚠ **CAUTION**



Before connecting or disconnecting the M.U.T.-III, turn the ignition switch to the "LOCK" (OFF) position.

Check again if the diagnosis code is set.

(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Drive the vehicle at 6 km/h or more.
(6) Check if the diagnosis code is set.
(7) Turn the ignition switch to the "LOCK" (OFF) position.
(8) Disconnect M.U.T.-III.

Q: Is code No.C1861 set?

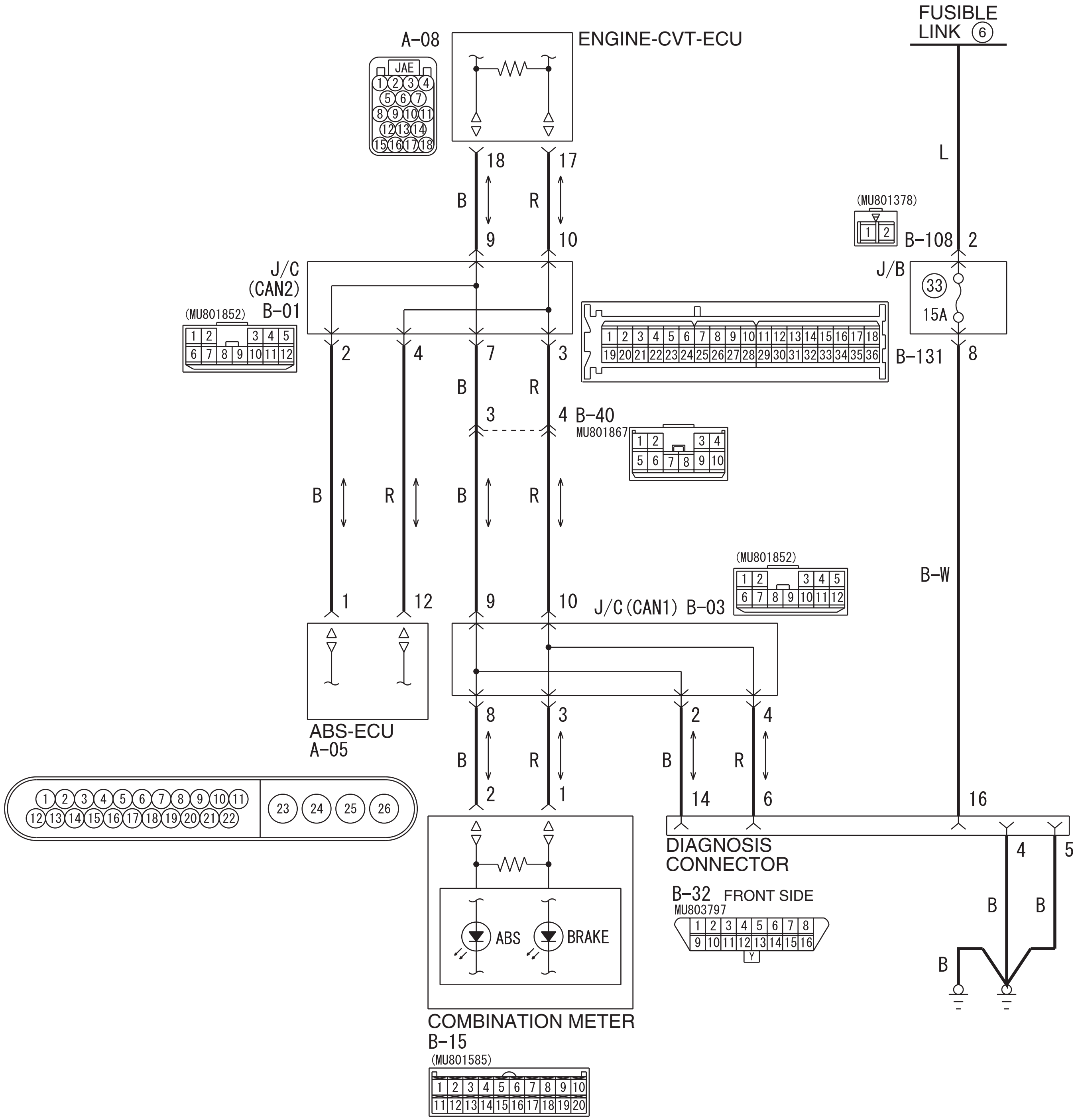
YES : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to P.35B-78).

NO : The malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-13.

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Code No.U1073: Trouble in CAN bus system

CAN Communication Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Gray R : Red P : Pink V : Violet

W3N35X007A

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⚠ CAUTION
- **If diagnosis code U1073 is set in the ABS-ECU, always diagnose the CAN main bus line. If there is any fault in the CAN bus lines, an incorrect diagnosis code may be set.**
- **Whenever the ECU is replaced, ensure that the communication circuit is normal.**

TROUBLE JUDGMENT

This code is stored when the ABS-ECU has ceased the CAN communication (bus off). Then, if a penalty mode is entered after approximately five minutes, regular data transmission will be cancelled.

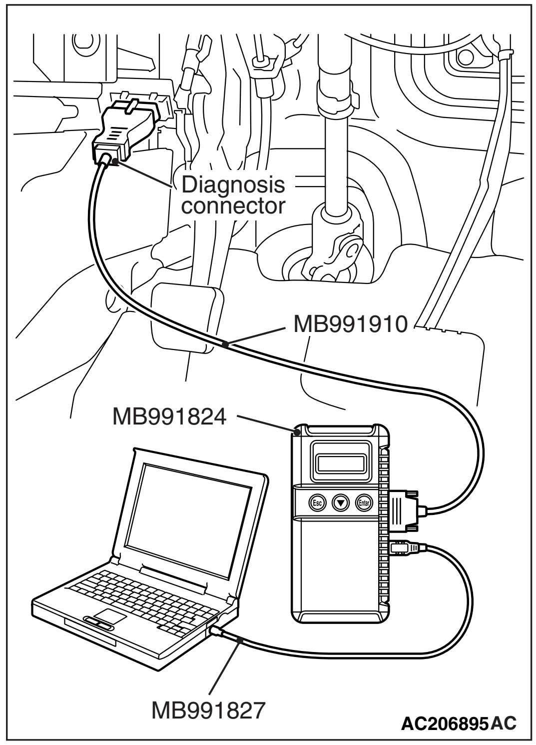
PROBABLE CAUSES

- Damaged wiring harness or connector
- Malfunction of the hydraulic unit (integrated with ABS-ECU)

DIAGNOSIS PROCEDURE

M.U.T.-III CAN bus diagnostics

⚠ CAUTION



Before connecting or disconnecting the M.U.T.-III, turn the ignition switch to the "LOCK" (OFF) position.

(1) Connect M.U.T.-III to the 16-pin diagnosis connector.
(2) Turn the ignition switch to the "ON" position.
(3) Diagnose the CAN bus line.
(4) Turn the ignition switch to the "LOCK" (OFF) position.
(5) Disconnect M.U.T.-III.

Q: Is the check result normal?

YES : The malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-13.

NO : Repair the CAN bus line (Refer to GROUP 54D – Diagnosis P.54D-13).

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INSPECTION CHART FOR TROUBLE SYMPTOMS

M1352011400813

NOTE: If steering movements are made when driving at high speed, or when driving on road surfaces with low frictional resistance, or when passing over bumps, the ABS may operate although sudden braking is not being applied. Because of this, when getting information from the customer, check if the problem occurred while driving under such conditions as these.

NOTE: During ABS operation, the brake pedal may vibrate a little or may not be able to be pressed. Such conditions are due to intermittent changes in hydraulic pressure inside the brake line to prevent the wheels from locking. This is normal.

Trouble symptoms	Inspection procedure No.	Reference page
Communication between M.U.T.-III and the ABS-ECU is not possible.	1	P.35B-58
ABS-ECU power supply system	2	P.35B-60
The ABS warning lamp does not illuminate with the ignition switch on.	3	P.35B-65
The ABS warning lamp does not extinguish after the engine is started.	4	P.35B-67
The ABS operates too frequently (no diagnosis code is set)	5	P.35B-71

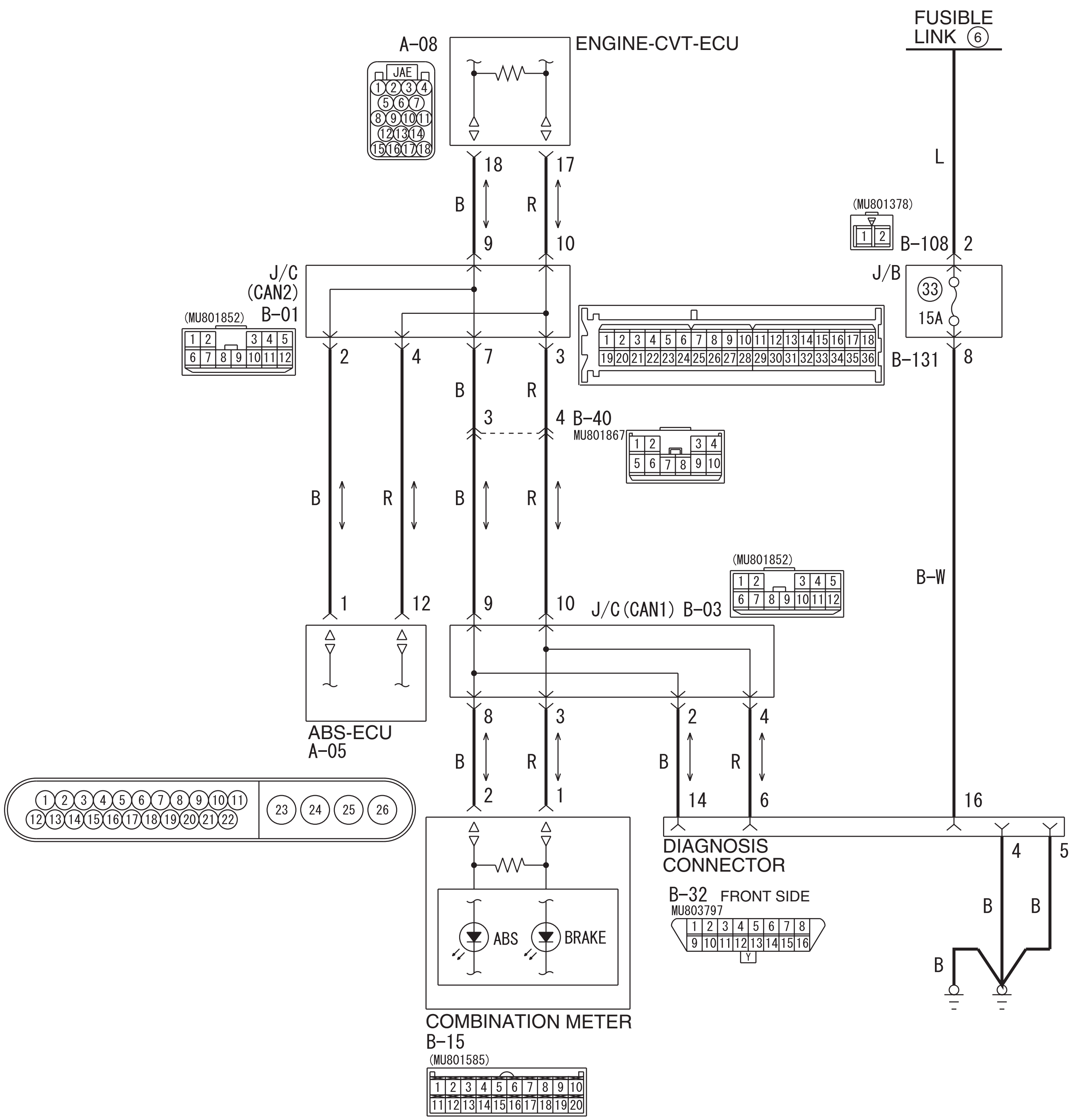
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INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

Inspection Procedure 1: Communication between M.U.T.-III and the ABS-ECU is not possible.

CAN Communication Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Gray R : Red P : Pink V : Violet

W3N35X007A

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COMMENTS ON TROUBLE SYMPTOM

If the M.U.T.-III cannot communicate with the ABS system, the CAN bus lines may be defective. If the ABS system does not work, the ABS-ECU or its power supply circuit may be defective. This symptom also appears when an incorrect vehicle model is selected on the M.U.T.-III.

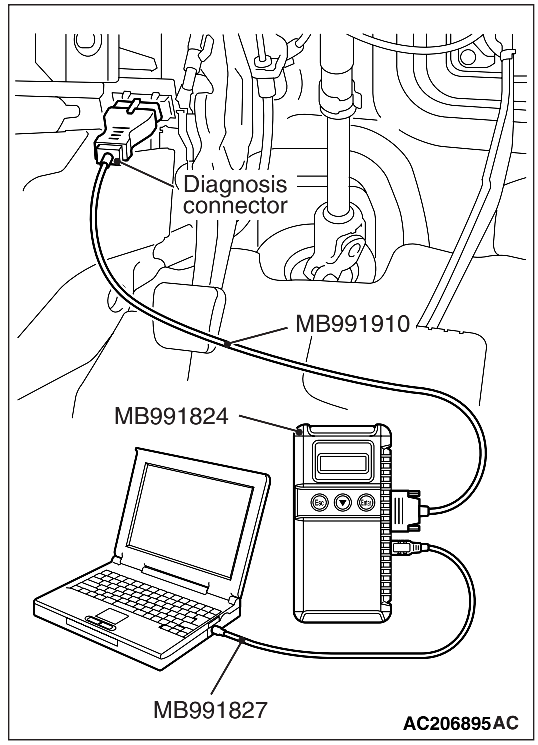
POSSIBLE CAUSES

- Damaged harness wires and connectors
- The ABS-ECU is defective.

DIAGNOSIS PROCEDURE

M.U.T.-III CAN bus diagnostics

⚠ CAUTION



Before connecting or disconnecting the M.U.T.-III, turn the ignition switch to the "LOCK" (OFF) position.

(1) Connect M.U.T.-III to the 16-pin diagnosis connector.
(2) Turn the ignition switch to the "ON" position.
(3) Diagnose the CAN bus line.
(4) Turn the ignition switch to the "LOCK" (OFF) position.
(5) Disconnect M.U.T.-III.

Q: Is the check result normal?

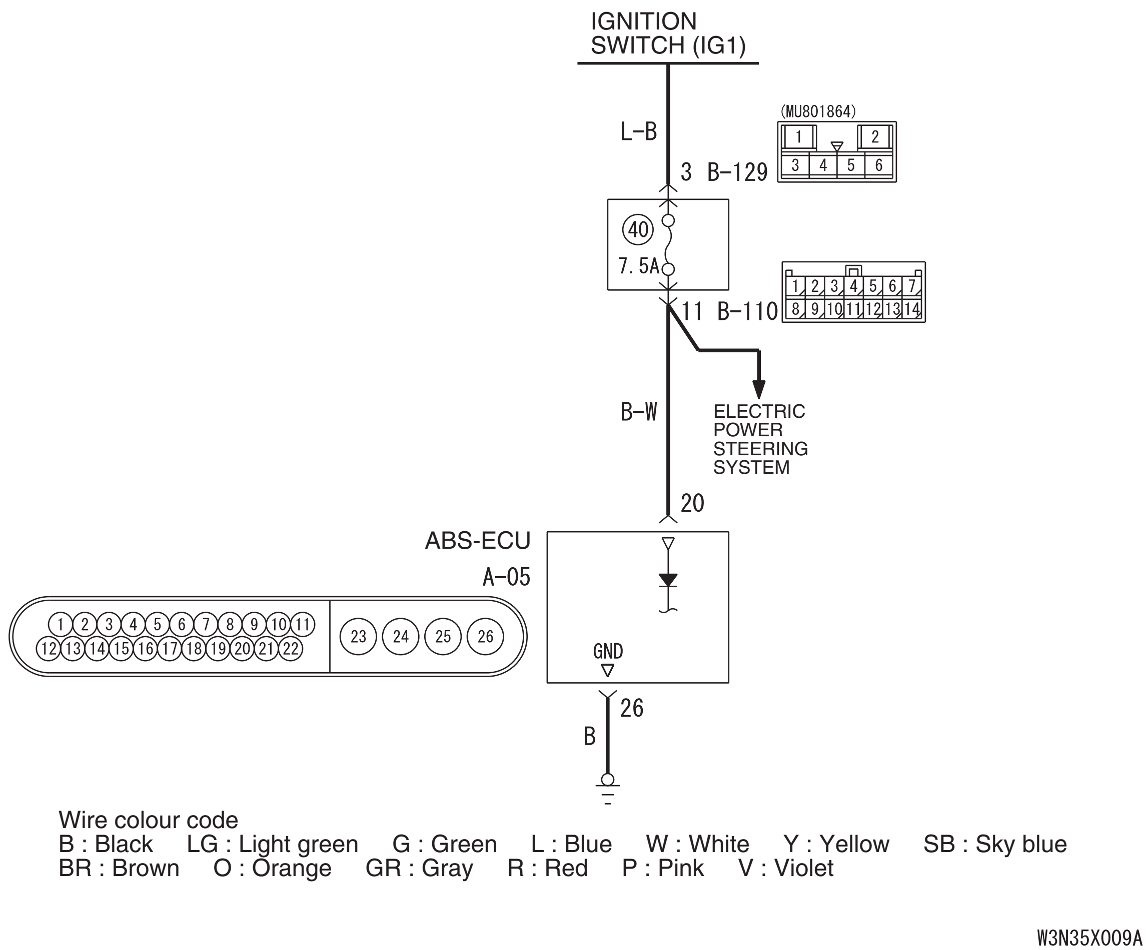
YES : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to P.35B-78).

NO : Repair the CAN bus line (Refer to GROUP 54D, Diagnosis P.54D-13).

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Inspection Procedure 2: ABS-ECU power supply system

ABS-ECU Power Supply and Earth Circuit



OPERATION

- The ABS-ECU is energized by the ignition switch (IG1) through multi-purpose fuse 2 and the ABS-ECU terminal 20.
- If the power supply to the ABS-ECU has failed, M.U.T.-III will not be able to communicate with it.

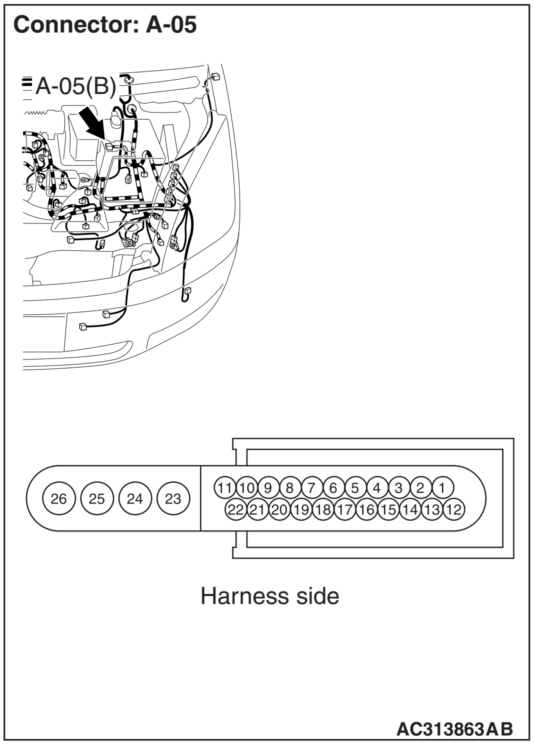
PROBABLE CAUSES

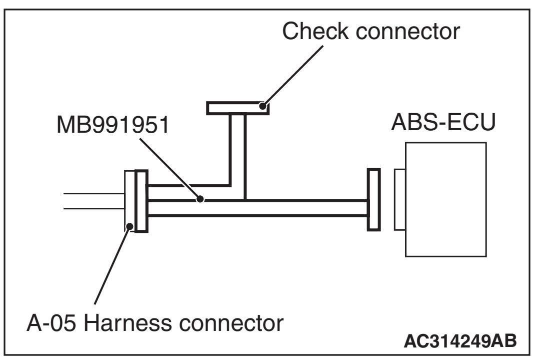
- Damaged wiring harness or connector
- Defective battery
- Charging system failed
- Malfunction of the hydraulic unit (integrated with ABS-ECU)

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DIAGNOSIS PROCEDURE

STEP 1. Voltage measurement at ABS-ECU connector A-05.

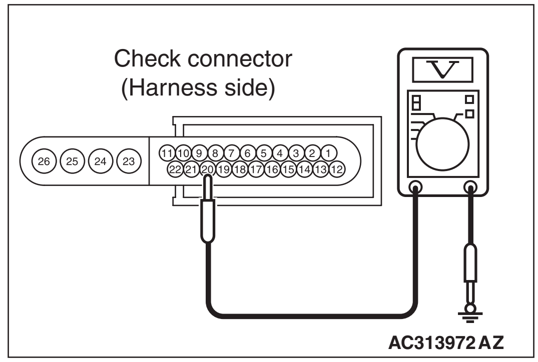




(1) Disconnect the connector A-05, and connect special tool ABS Check Harness (MB991974) to the wiring harness-side connector.

NOTE: . Do not connect special tool ABS Check Harness (MB991974) to the ABS-ECU.

(2) Turn the ignition switch to the "ON" position.



(3) Measure the voltage between terminal 20 and earth.

OK: System voltage

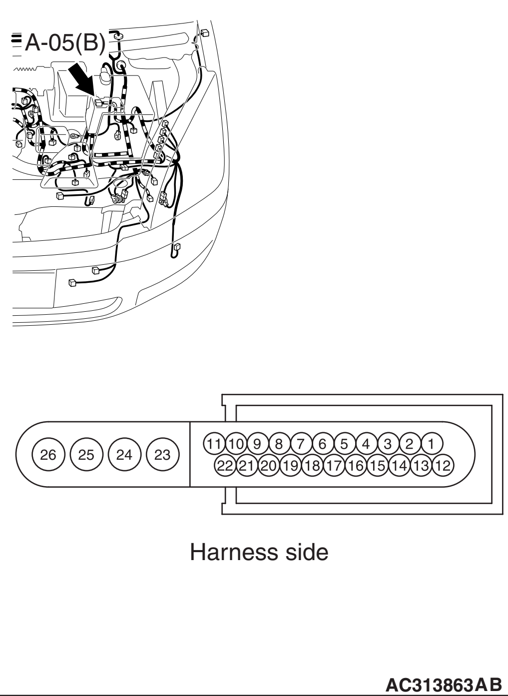
Q: Is the check result normal?

YES : Go to Step 3.
NO : Go to Step 2.

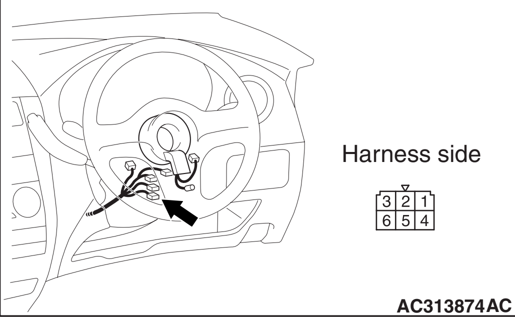
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STEP 2. Connector check: ABS-ECU connector A-05, ignition switch connector B-141, junction block connectors C-110 and C-129

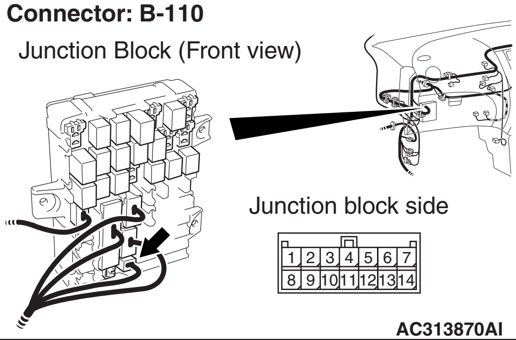
Connector: A-05



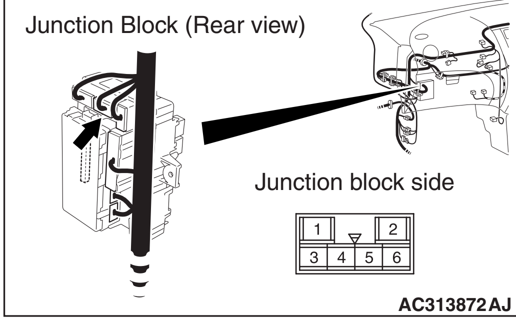
Connector: B-141



Connector: B-110



Connector: B-129



Check the connectors, for loose, corroded or damaged terminals, or terminals pushed back in the connector.

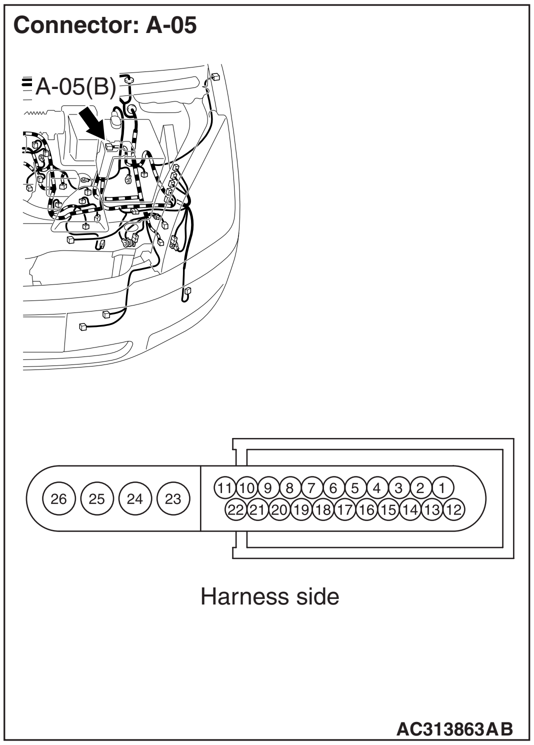
Q: Is the check result normal?

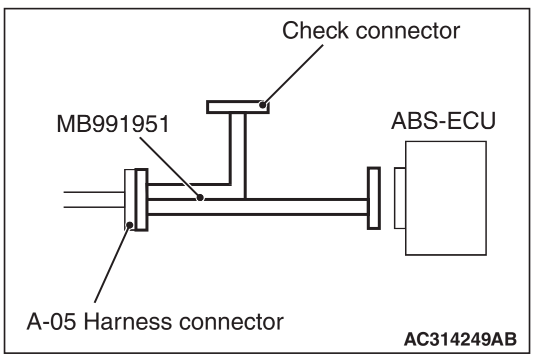
YES : An open or short circuit may be present in the power supply line to the ABS-ECU. Repair the wiring harness between ABS-ECU connector A-05 terminal 20 and ignition switch connector B-141 terminal 2. Go to Step 8.

NO : Repair or replace the damaged component(s). Then go to Step 8.

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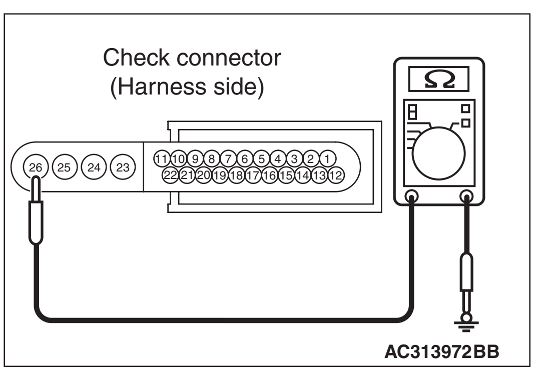
STEP 3. Resistance measurement at ABS-ECU connector A-05.





(1) Disconnect the connector A-05, and connect special tool ABS Check Harness (MB991974) to the wiring harness-side connector.

NOTE: Do not connect special tool ABS Check Harness (MB991974) to the ABS-ECU.



(2) Measure the resistance between terminal 26 and earth.

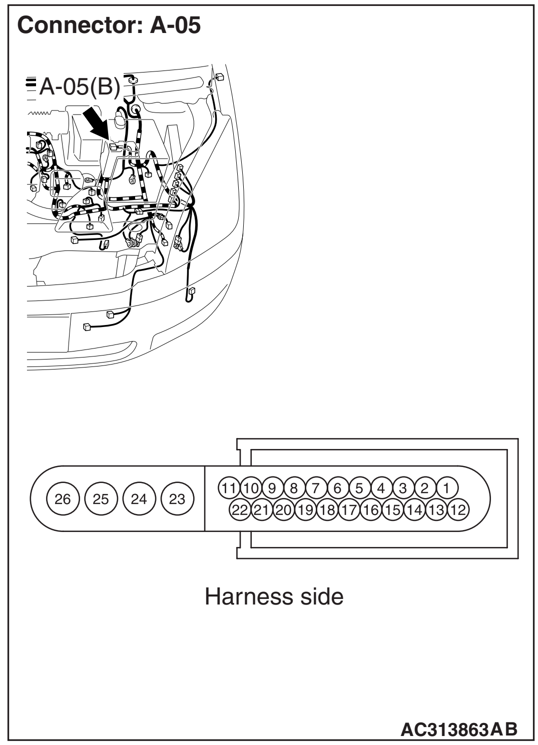
OK: Continuity exists (2 Ω or less)

Q: Is the check result normal?

YES : Go to Step 5.

NO : Go to Step 4.

STEP 4. Check ABS-ECU connector A-05 for loose, corroded or damaged terminals, or terminals pushed back in the connector.



Q: Is the check result normal?

YES : An open circuit may be present in the earth circuit. Repair the wiring harness between ABS-ECU connector A-05 terminals 26 and the body earth. Then go to Step 8.

NO : Repair or replace the damaged component(s). Then go to Step 8.

STEP 5. Check the battery.

Check the battery (Refer to GROUP 54A, Battery test P.54A-5).

Q: Is the check result normal?

YES : Go to Step 6.

NO : Charge or replace the battery. Then go to Step 8.

STEP 6. Check the charging system.

Check the charging system (Refer to GROUP 16, Charging system P.16-6).

Q: Is the check result normal?

YES : Go to Step 7.

NO : Repair or replace the charging system component(s).Then go to Step 8.

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STEP 7. Retest the system.

Q: Can the ABS-ECU communicate with the M.U.T.-III?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-13.

NO : Replace the ABS-ECU. Then go to Step 8.

STEP 8. Retest the system.

Q: Can the ABS-ECU communicate with the M.U.T.-III?

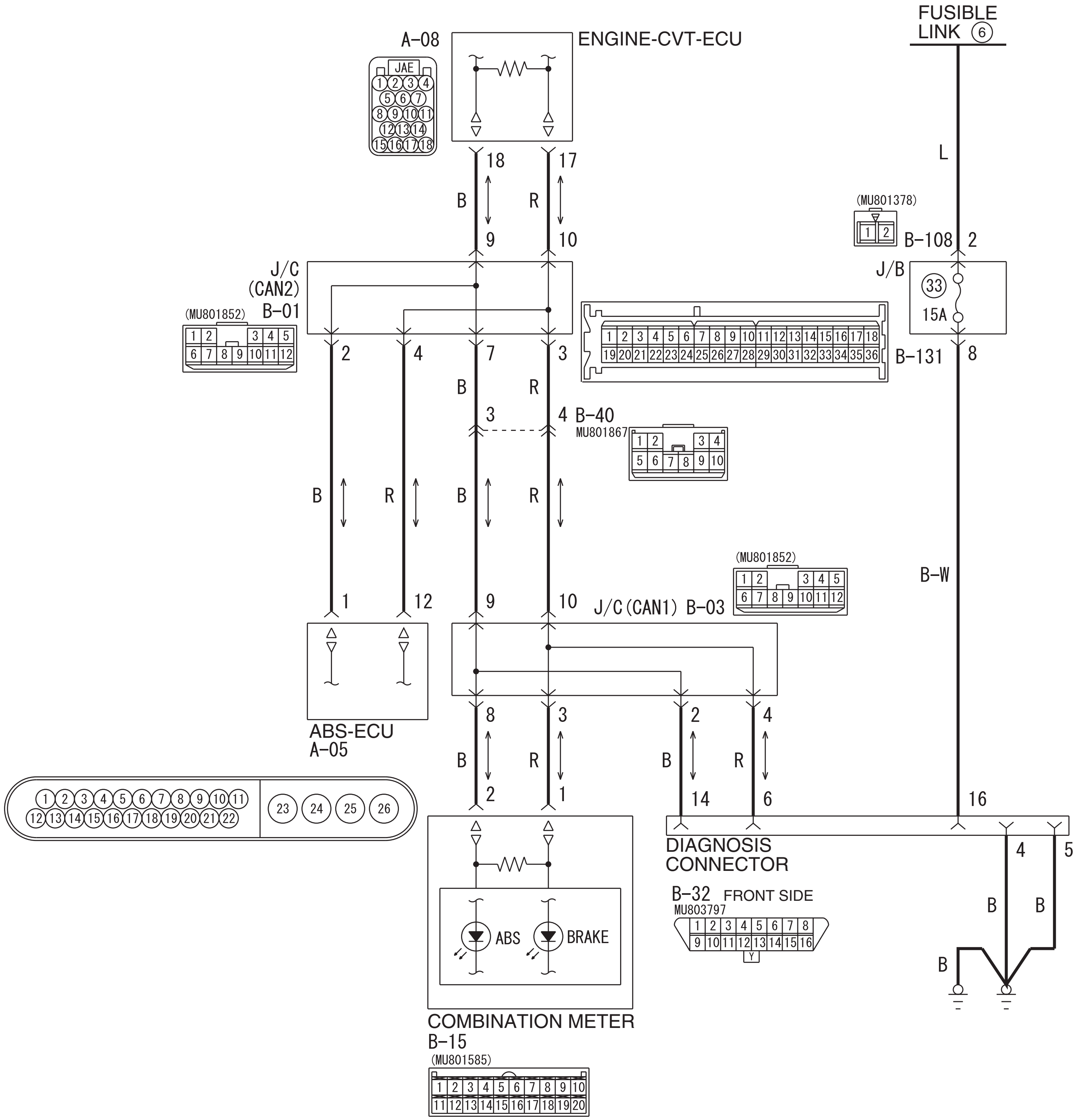
YES : The procedure is complete.

NO : Go to Step 1.

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Inspection Procedure 3: The ABS warning lamp does not illuminate with the ignition switch on.

CAN Communication Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Gray R : Red P : Pink V : Violet

W3N35X007A

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COMMENTS ON TROUBLE SYMPTOM

- Drive signal of the ABS warning lamp (including bulb check) is sent from the ABS-ECU to the combination meter through the CAN communication lines.
- If there is a problem in the CAN communication lines, the ABS-ECU will detect a time-out error at the combination meter side and illuminate the ABS warning lamp. Therefore, a failure in the CAN communication lines need not be considered. Power supply to the ABS-ECU need not also be suspected.
- The ABS warning lamp is a non-replaceable LED. If the lamp is blown, replace the combination meter.
- Perform the actuator test to illuminate the lamps in the combination meter. If the lamp does not illuminate, replace the combination meter. If it illuminates, replace the ABS-ECU.
- It is also suspected that the combination meter does not obey the commands from the ABS-ECU. If the combination meter does not function even after the ABS-ECU is replaced, replace the combination meter.

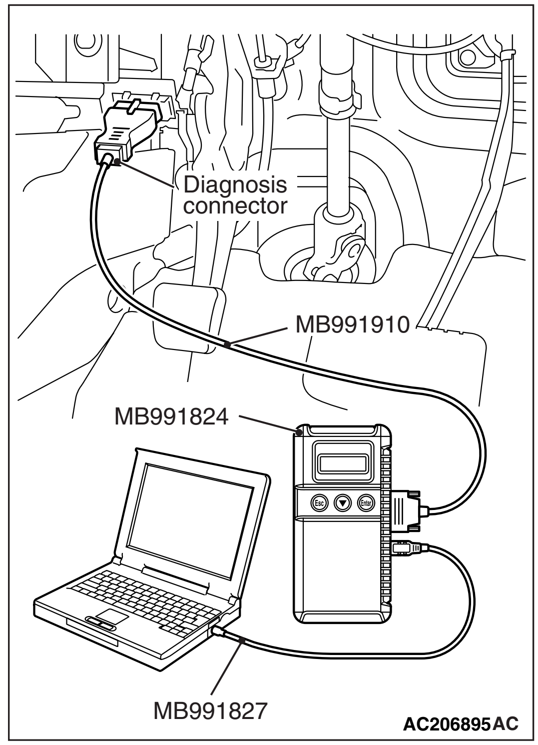
POSSIBLE CAUSES

- Defective combination meter (incorporating the meter-ECU)
- The ABS-ECU is defective.

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III actuator test

⚠ CAUTION



Before connecting or disconnecting the M.U.T.-III, turn the ignition switch to the "LOCK" (OFF) position.

(1) Connect M.U.T.-III to the 16-pin diagnosis connector.
(2) Turn the ignition switch to the "ON" position.
(3) Execute combination meter actuator test.
- Item A0: Indicator lamp and warning lamp (illumination)

(4) Turn the ignition switch to the "LOCK" (OFF) position.
(5) Disconnect M.U.T.-III.

Q: Does the ABS warning lamp illuminate normally?

YES : Replace the combination meter (integrated with meter-ECU) (Refer to GROUP 54A, Combination Meter P.54A-67). Then go to Step 2.

NO : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to P.35B-78).

STEP 2. Recheck the trouble symptom.

Q: Does the ABS warning lamp illuminate with the ignition switch ON?

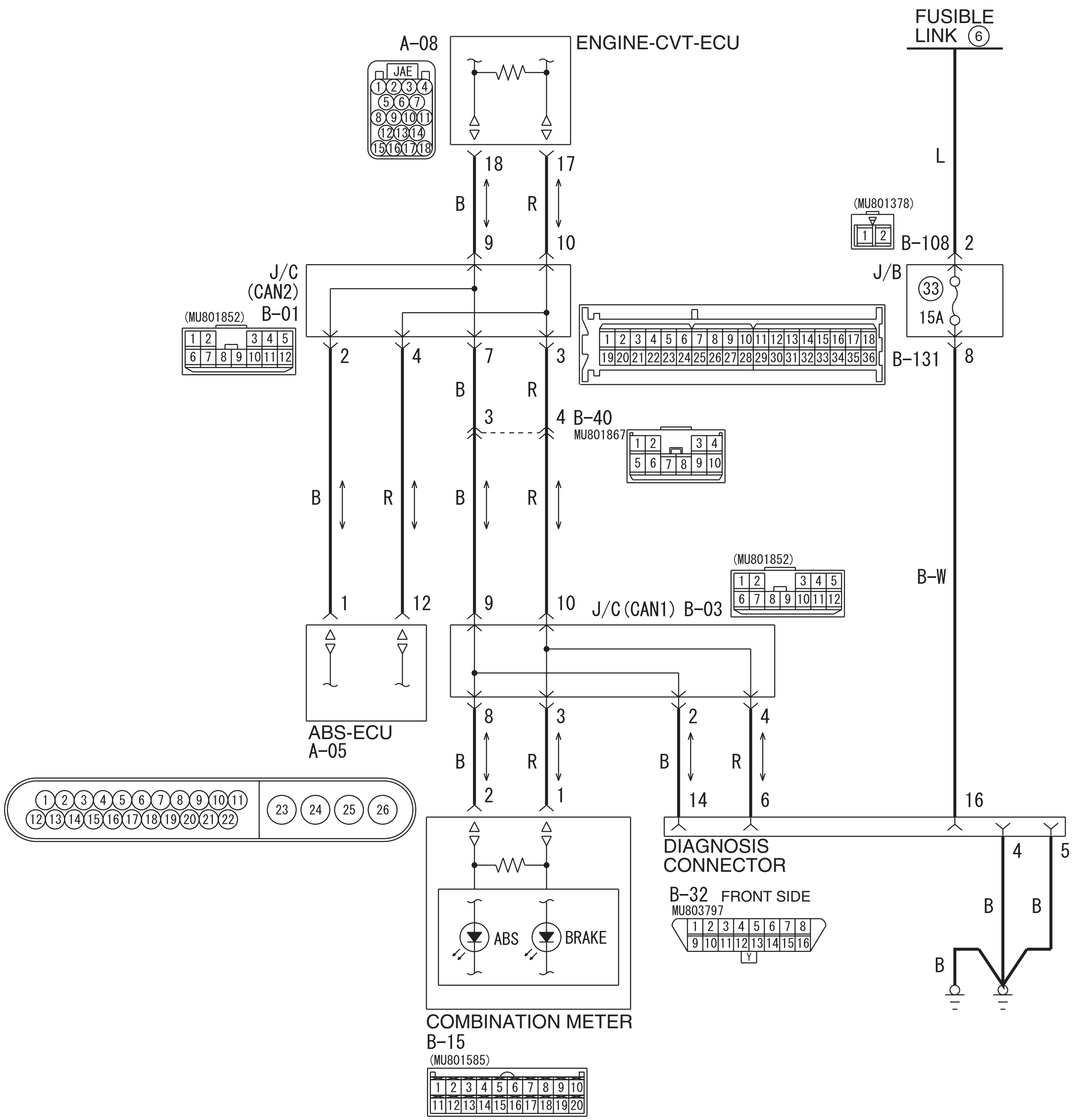
YES : This diagnosis is complete.

NO : Replace the combination meter (integrated with meter-ECU) (Refer to GROUP 54A, Combination Meter P.54A-67).

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Inspection Procedure 4: The ABS warning lamp does not extinguish after the engine is started.

CAN Communication Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Gray R : Red P : Pink V : Violet

W3N35X007A

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COMMENTS ON TROUBLE SYMPTOM

- If the ABS system fails, the ABS-ECU will send a lamp drive signal to the combination meter through the CAN communication lines.
- If the combination meter detects a ABS time-out due to a failure in the power supply to the ABS-ECU or abnormal CAN communication, the combination meter illuminates the lamp.
- If the CAN bus communication fails, refer to GROUP 54D, CAN Bus Diagnostics Table P.54D-13.
- If a trouble occurs in the power supply to the ABS-ECU (i.e. excessively high resistance in the power supply or earth lines), this trouble symptom will appear., but the diagnosis code will not be set. Then, if you drive the vehicle at 6 km/h or more, the ECU will set diagnosis code C1861.
- Perform the actuator test to extinguish the lamp in the combination meter. If it does not extinguish, replace the combination meter. If it extinguishes, replace the ABS-ECU.
- It is also suspected that the combination meter does not obey the commands from the ABS-ECU. If the combination meter does not function after the ABS-ECU is replaced, replace the combination meter.

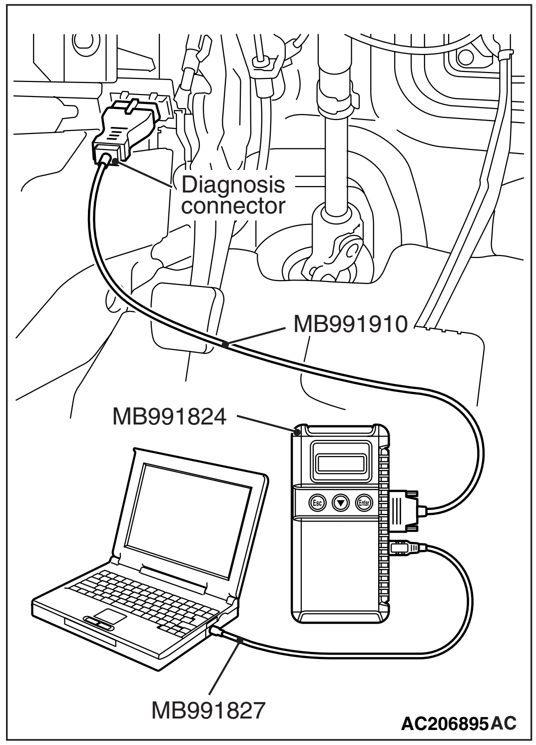
POSSIBLE CAUSES

- Damaged harness wires and connectors
- Defective combination meter (incorporating the meter-ECU)
- The ABS-ECU is defective.
- The power supply circuit is defective.

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics

⚠ CAUTION



Before connecting or disconnecting the M.U.T.-III, turn the ignition switch to the "LOCK" (OFF) position.

(1) Connect M.U.T.-III to the 16-pin diagnosis connector.
(2) Turn the ignition switch to the "ON" position.
(3) Diagnose the CAN bus line.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the check result normal?

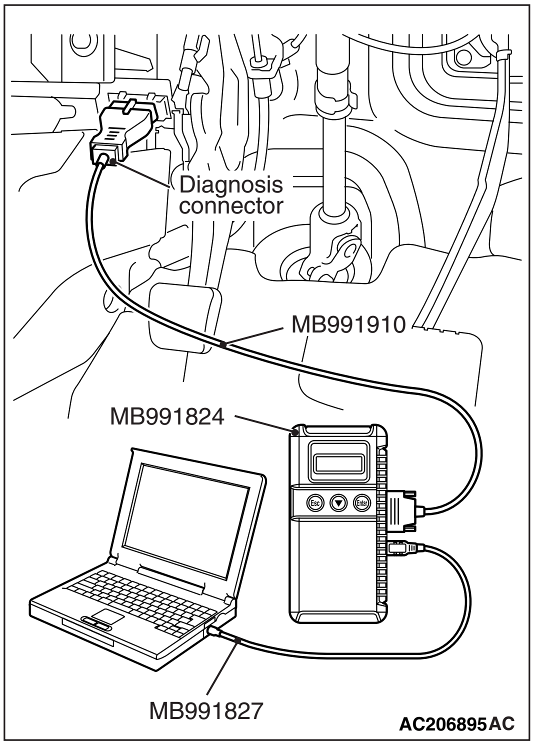
YES : Go to Step 2.

NO : Repair the CAN bus line (Refer to GROUP 54D, Diagnosis P.54D-13).

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STEP 2. M.U.T.-III diagnosis code

⚠ CAUTION



Before connecting or disconnecting the M.U.T.-III, turn the ignition switch to the "LOCK" (OFF) position.

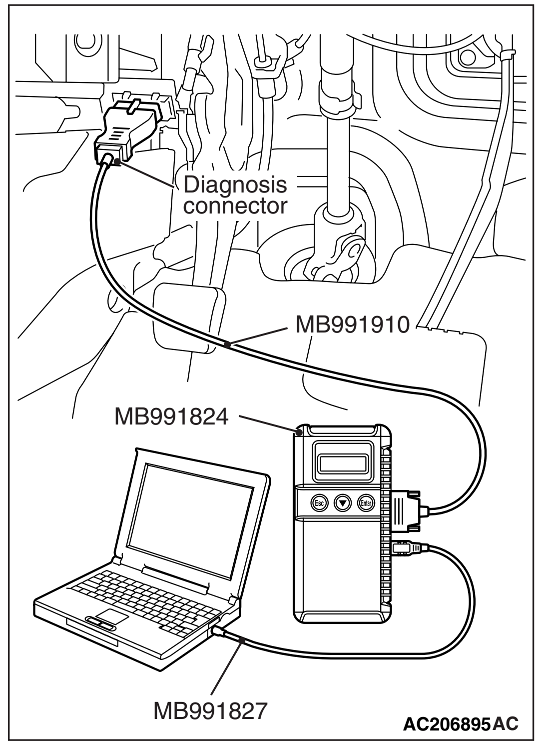
(1) Connect M.U.T.-III to the 16-pin diagnosis connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check whether the ABS-related diagnosis code is set.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the check result normal?

YES : Go to Step 3.
NO : Carry out the diagnosis for the diagnosis code (Refer to P.35B-7).

STEP 3. M.U.T.-III diagnosis code

⚠ CAUTION



Before connecting or disconnecting the M.U.T.-III, turn the ignition switch to the "LOCK" (OFF) position.

(1) Connect M.U.T.-III to the 16-pin diagnosis connector.
(2) Turn the ignition switch to the "ON" position.
(3) Drive the vehicle at 10 km/h or more. Then use the M.U.T.-III to check whether the ABS diagnosis code is reset.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

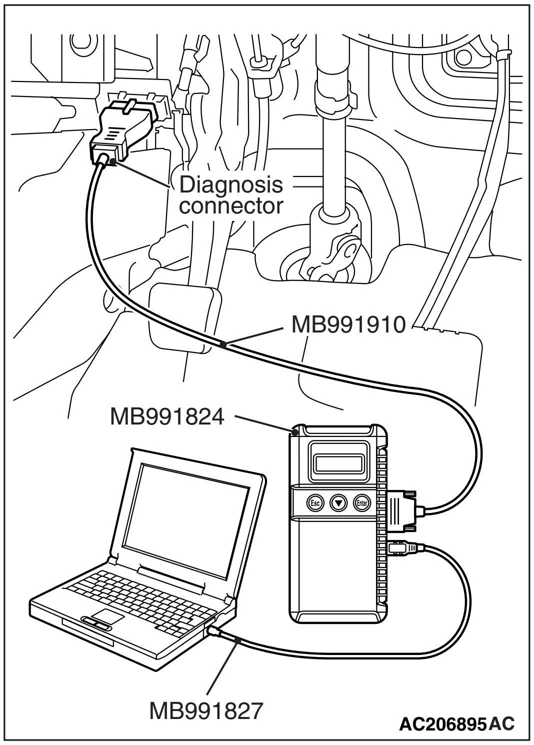
Q: Is the check result normal?

YES : Go to Step 4.
NO : Carry out the diagnosis for the diagnosis code (Refer to P.35B-7).

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STEP 4. M.U.T.-III actuator test

⚠ CAUTION



Before connecting or disconnecting the M.U.T.-III, turn the ignition switch to the "LOCK" (OFF) position.

(1) Connect M.U.T.-III to the 16-pin diagnosis connector.
(2) Turn the ignition switch to the "ON" position.
(3) Execute combination meter actuator test.
- Item A1: Indicator lamp and warning lamp (extinguish)

(4) Turn the ignition switch to the "LOCK" (OFF) position.
(5) Disconnect M.U.T.-III.

Q: Does the ABS warning lamp extinguish normally?

YES : . Replace the combination meter (integrated with meter-ECU) (Refer to GROUP 54A, Combination Meter P.54A-67). Then go to Step 5.

NO : . Replace the hydraulic unit (integrated with ABS-ECU) (Refer to P.35B-78).

STEP 5. Recheck the trouble symptom.

Q: Does the ABS warning lamp extinguish after the engine has been started?

YES : This diagnosis is complete.

NO : Replace the combination meter (integrated with meter-ECU) (Refer to GROUP 54A, Combination Meter P.54A-67).

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Inspection Procedure 5: The ABS operates too frequently (no diagnosis code is set)

COMMENTS ON TROUBLE SYMPTOM

- This trouble symptom will not appear due to a failure in wiring harness (open or short circuit, or excessive resistance). Therefore, if the sensors are installed properly and the check result does not indicate any problems, replace the ABS-ECU.

POSSIBLE CAUSES

- Wheel speed sensor malfunction
- Hub malfunction
- ABS-ECU malfunction

DIAGNOSIS PROCEDURE

STEP 1. Check the wheel speed sensors for proper installation.

Check that the wheel speed sensors are installed correctly (e.g. loosely tightened bolts).

Q: Is the check result normal?

YES : Go to Step 2.

NO : Reinstall the wheel speed sensor(s) properly.

STEP 2. Remove the wheel speed sensors and check them.

Refer to P.35B-81.

Q: Is the check result normal?

YES : Go to Step 3.

NO : Replace the wheel speed sensor (Refer to P.35B-80).

STEP 3. Check the encoder for detecting wheel speed.

Check the encoder for presence of foreign objects or deformation.

Q: Is the check result normal?

YES : Go to Step 4.

NO : If foreign objects are found, clean the encoder. If deformation is found, replace the hub [Refer to GROUP 26, Front Axle Hub Assembly P.26-6 <Front (vehicles with 14 inch brake)> or P.26-9 <Front (vehicles with 15 inch brake)> or GROUP 27, Rear Axle Hub P.27-6 <Rear>].

STEP 4. Check the wheel bearing for excessive play.

Front: refer to GROUP 26, On-vehicle Service – Wheel Bearing Axial Play Check P.26-5.
Rear: refer to GROUP 27, On-vehicle Service – Wheel Bearing Axial Play Check P.27-3.

Q: Is the check result normal?

YES : Go to Step 5.

NO : Replace the hub assembly [Refer to GROUP 26, Front Axle Hub Assembly P.26-6 <Front (vehicles with 14 inch brake)> or P.26-9 <Front (vehicles with 15 inch brake)> or GROUP 27, Rear Axle Hub P.27-6 <Rear>].

STEP 5. Recheck the trouble symptom.

Q: Does the ABS operate too frequently?

YES : The malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-13.

NO : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to P.35B-78).

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DATA LIST REFERENCE TABLE

M1352011500746

The following items can be read by the M.U.T.-III from the ABS-ECU input data.

When the system is normal.

Item No.	Check item	Checking requirements	Normal valve
01	Front-right wheel speed sensor	Perform a test run	Vehicle speeds displayed on the speedometer and M.U.T.-III are identical.
02	Front-left wheel speed sensor		
03	Rear-right wheel speed sensor		
04	Rear-left wheel speed sensor		
05	Power supply voltage	Ignition: ON	10 – 16V or more
06	Stop lamp switch	When the brake pedal is depressed	ON
		When the brake pedal is released	OFF
07	Valve relay	When ABS is operating	ON
		When ABS is not operating	OFF
10	FL inlet valve	When ABS is operating	ON
		When ABS is not operating	OFF
11	FL outlet valve	When ABS is operating	ON
		When ABS is not operating	OFF
12	FR inlet valve	When ABS is operating	ON
		When ABS is not operating	OFF
13	FR outlet valve	When ABS is operating	ON
		When ABS is not operating	OFF
14	RL inlet valve	When ABS is operating	ON
		When ABS is not operating	OFF
15	RL outlet valve	When ABS is operating	ON
		When ABS is not operating	OFF
16	RR inlet valve	When ABS is operating	ON
		When ABS is not operating	OFF
17	RR outlet valve	When ABS is operating	ON
		When ABS is not operating	OFF
20	Pump motor	When ABS is operating	ON
		When ABS is not operating	OFF

When the ABS-ECU shut off ABS operation.

When the diagnosis system stops the ABS-ECU, the M.U.T.-III display data will be unreliable.

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ACTUATOR TEST REFERENCE TABLE

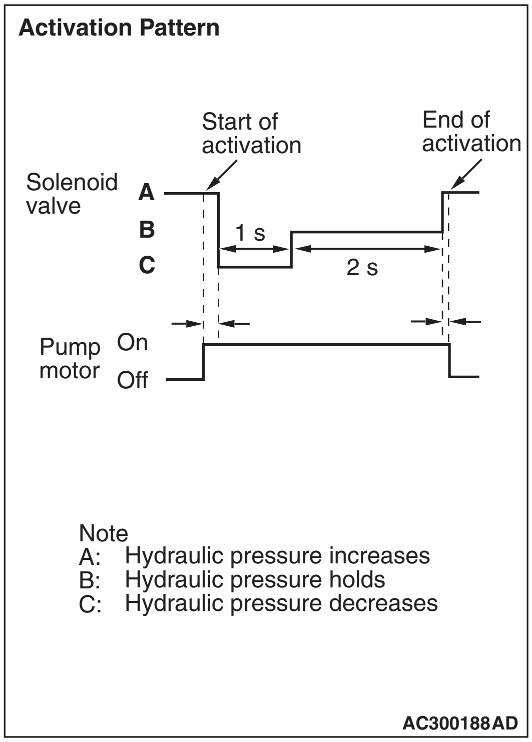
M1352011600743

The M.U.T.-III activates the following actuators for testing.

NOTE: If the ABS-ECU runs down, actuator testing cannot be carried out.

NOTE: Actuator testing is only possible when the vehicle is stationary.

ACTUATOR TEST SPECIFICATIONS

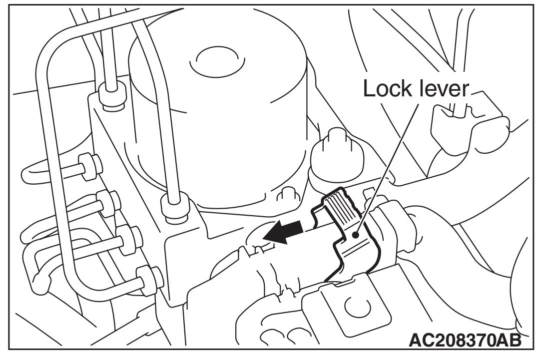


No.	Item	
01	Solenoid valve for front-left wheel	Solenoid valves and pump motor in the hydraulic unit (simple inspection mode)
02	Solenoid valve for front-right wheel	
03	Solenoid valve for rear-left wheel	
04	Solenoid valve for rear-right wheel	

CHECK AT ABS-ECU

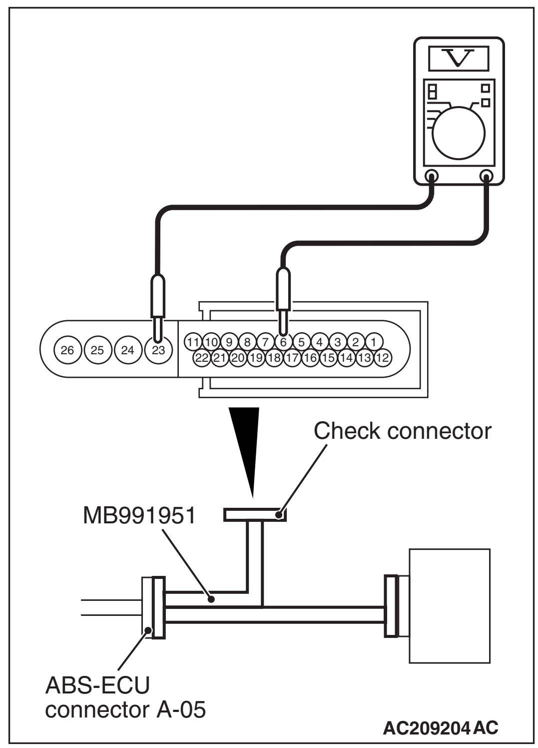
M1352011800725

Use the following steps to remove the connector cover and measure the terminal voltage.



1. Move the lock lever of the ABS-ECU connector as shown in the illustration, and then disconnect the ABS-ECU connector.

TERMINAL VOLTAGE CHECK CHART



1. Measure the voltages between earth terminal (23) or (26) and each respective terminal.
2. The terminal layouts are shown in the illustrations below.

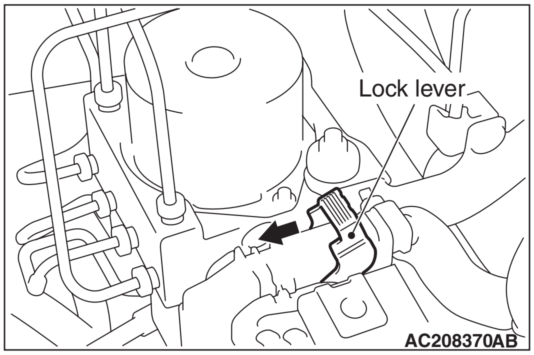
NOTE: Do not measure terminal voltage for approximately three seconds after the ignition switch is turned to the "ON" position. The ABS-ECU performs the initial check during that period.

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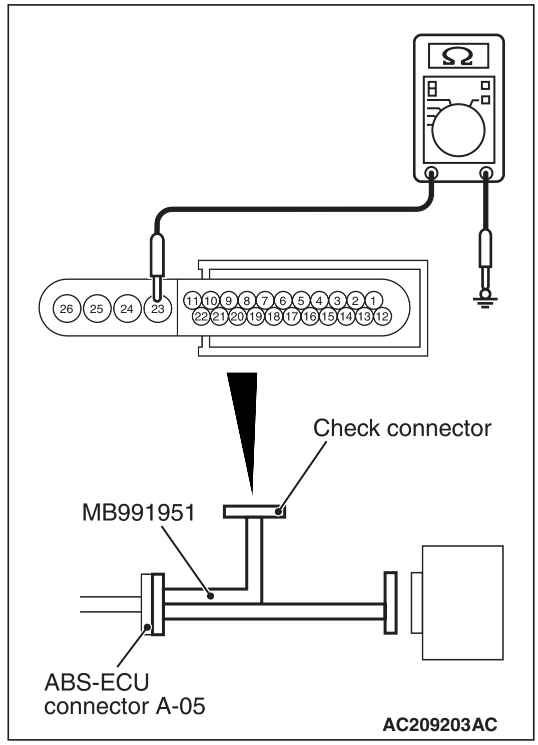
Terminal No.	Check item	Checking requirements	Normal condition
18	Input to stop lamp switch	Stop lamp switch: OFF	System voltage
		Stop lamp switch: ON	Approximately 0 V
6	Input from front wheel speed sensor (RH)	Ignition switch: ON	0.4 – 1.3 V
7	Power supply to front wheel speed sensor (RH)	Ignition switch: ON	System voltage
8	Power supply to rear wheel speed sensor (RH)	Ignition switch: ON	System voltage
10	Power supply to rear wheel speed sensor (LH)	Ignition switch: ON	System voltage
11	Input from front wheel speed sensor (LH)	Ignition switch: ON	0.4 – 1.3 V
19	Input from rear wheel speed sensor (RH)	Ignition switch: ON	0.4 – 1.3 V
20	Power supply from ignition switch (IG1)	Ignition switch: ON	System voltage
21	Input from rear wheel speed sensor (LH)	Ignition switch: ON	0.4 – 1.3 V
22	Power supply to front wheel speed sensor (LH)	Ignition switch: ON	System voltage
23	Earth (solenoid valve and ABS-ECU)	Always	0 V
24	Battery power supply <solenoid valve (fusible link No.5)>	Always	System voltage
25	Battery power supply <motor (fusible link No.3)>	Always	System voltage
26	Earth (motor)	Always	0 V

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RESISTANCE AND CONTINUITY BETWEEN HARNESS-SIDE CONNECTOR TERMINALS



1. Turn the ignition switch to the "LOCK" (OFF) position and disconnect the ABS-ECU connectors before checking resistance and continuity.
2. Check the resistance and continuity between the terminals indicated in the table below.



3. The terminal layout is shown in the illustration.

ABS-ECU terminal No.	Signal	Normal condition
23 – body earth	Earth	Less than 1 Ω
26 – body earth	Earth	Less than 1 Ω

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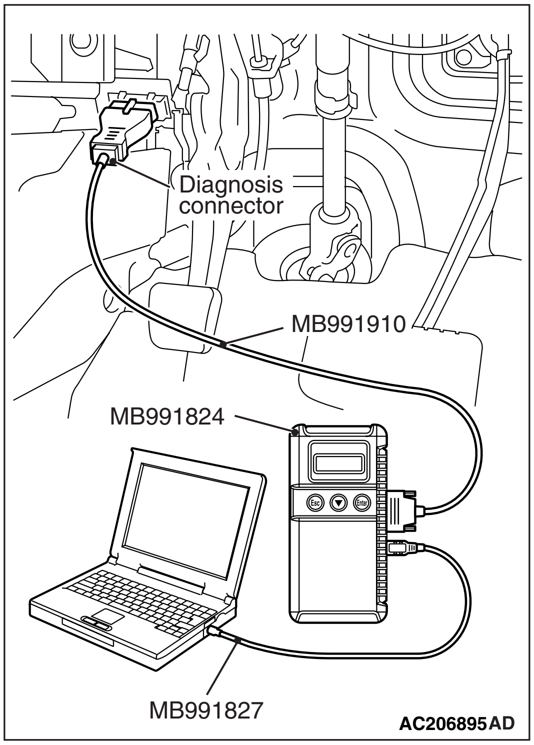
ON-VEHICLE SERVICE

HYDRAULIC UNIT CHECK

M1352001700705

1. Raise the vehicle, and support the specified area on axle stands.

⚠ **CAUTION**

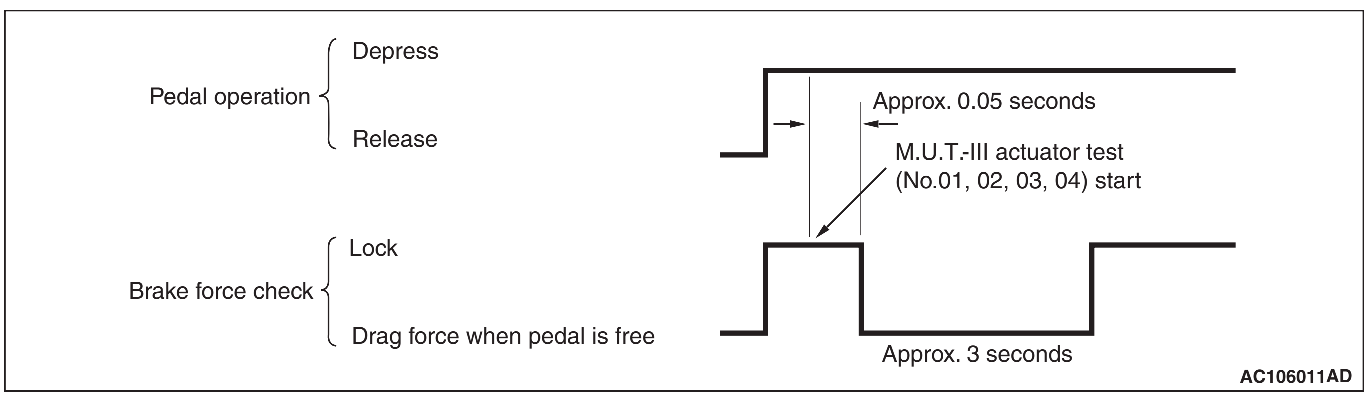


Before connecting or disconnecting the M.U.T.-III, turn the ignition switch to the "LOCK" (OFF) position.

2. Turn the ignition switch to the "LOCK (OFF)" position, and then set the M.U.T.-III.
3. Check that the selector lever is "N" position, and then start the vehicle engine.
4. Operate the M.U.T.-III to execute the actuator test while depressing the brake pedal. When executing the actuator test, check that the braking force changes by rotating the wheel with your hand.

   NOTE: During the actuator test, the ABS warning lamp illuminates and ABS control is prohibited.

   NOTE: When the ABS-ECU is not working due to the fail-safe, the M.U.T.-III actuator test cannot be executed.



5. This is indicated as shown above.
6. When it is abnormal as a result of the inspection, take action as described on the "Judgment table".

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JUDGMENT TABLE

Display on M.U.T.-III	Operation	Inspection results	Judgment	Cause	Action
01 FR wheel ABS 02 FL wheel ABS 03 RR wheel ABS 04 RL wheel ABS	• Depress the brake pedal and lock the wheels. • Select a wheel which is inspected on the M.U.T.-III and execute the actuator test. • Rotate the wheel selected and check the braking force.	The braking force has been weakened for 3 seconds in the locked states.	Normal	–	–
		The wheel is not locked when depressing the brake pedal.	Trouble	Clogged brake line other than hydraulic unit	The inspection and cleaning of brake line
				Clogged hydraulic pressure circuit inside of hydraulic unit	Replace the hydraulic unit assembly
		The braking force has not been weakened		The improper lines of hydraulic unit brake tube	Correct the lines.
				Malfunction of hydraulic unit solenoid valve operation	Replace the hydraulic unit assembly

7. Turn the ignition switch to LOCK (OFF) position, and then remove the M.U.T.-III after the inspection.

IN THE EVENT OF A DISCHARGED BATTERY

M1352003500633

⚠ ***WARNING***

If the ABS is not operating, the vehicle posture will be unstable during braking, Do not drive the vehicle with the ABS-ECU connector disconnected or with the ABS not operating for any other reason.

If the engine is started using a booster cable when the battery is completely flat, and the vehicle is then driven without waiting for the battery to be recharged, the engine may misfire and it may not be possible to drive the vehicle. This is because the ABS consumes a large amount of current when carrying out its initial checks. If this happens, recharge the battery fully.

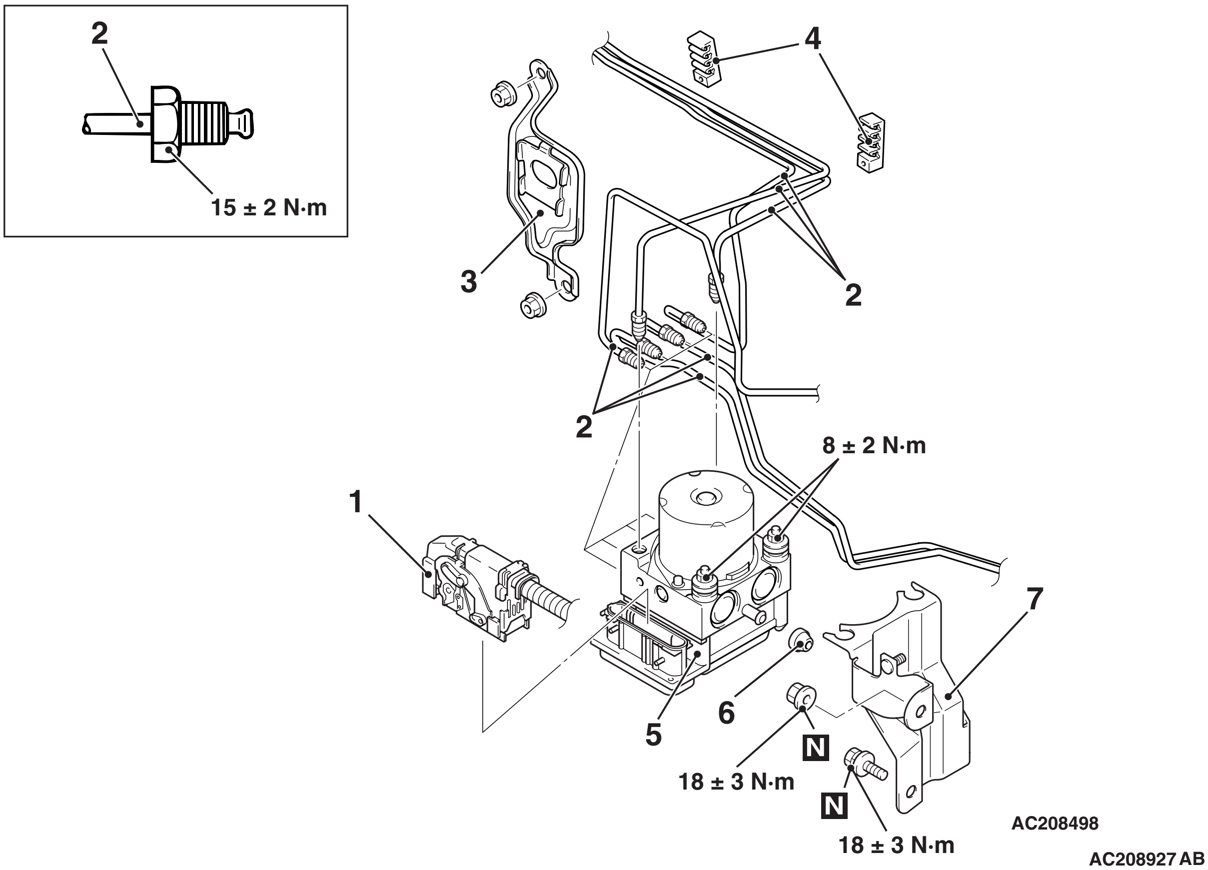
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HYDRAULIC UNIT

REMOVAL AND INSTALLATION

M1352018400104

Pre-removal operation	Post-installation operation
• Brake Fluid Draining • Air cleaner body assembly removal (Refer to GROUP 15, Air Cleaner P.15-5). • Fuel Vapour Canister Removal (Refer to GROUP 17, Canister P.17-18).	• Fuel Vapour Canister Installation (Refer to GROUP 17, Canister P.17-18). • Air cleaner body assembly installation (Refer to GROUP 15, Air Cleaner P.15-5). • Brake Line Bleeding (Refer to GROUP 35A, On-vehicle Service P.35A-10). • Hydraulic Unit Check (Refer to P.35B-76).



Removal steps

<<**A**>>	1.	ABS-ECU harness connector
>>**A**<<	2.	Brake tube connection
	3.	Fuel vapour canister bracket
	4.	Connection of brake tube and clip

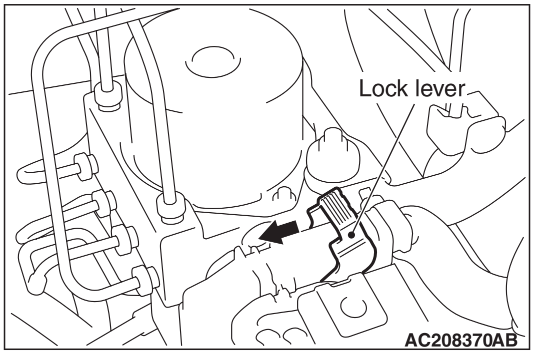
Removal steps (Continued)

<<**B**>>	5.	Hydraulic unit (ABS-ECU)
	6.	Hydraulic unit bracket insulator
	7.	Hydraulic unit bracket

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REMOVAL SERVICE POINTS

<<A>> HARNESS CONNECTOR DISCONNECTION



Move the lock lever of the ABS-ECU connector as shown in the illustration, and then disconnect the harness connector.

<<B>> HYDRAULIC UNIT (ABS-ECU) REMOVAL

⚠ *WARNING*

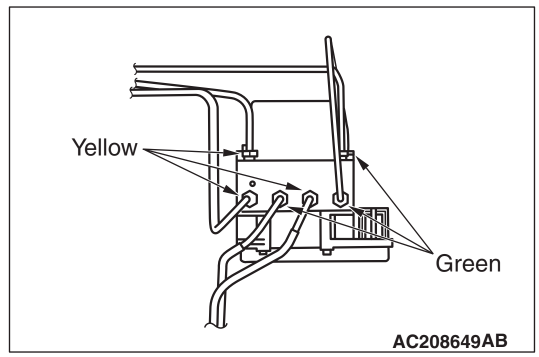
The hydraulic unit is heavy. Use care when removing it.

⚠ CAUTION

- **The hydraulic unit cannot be disassembled. Never loosen its nuts or bolts.**
- **Do not drop or shock the hydraulic unit.**
- **Do not turn the hydraulic unit upside down or lay it on its side.**

INSTALLATION SERVICE POINTS

>>A<< BRAKE TUBE INSTALLATION



Install each brake tube according to the colour of the flare nut as shown.

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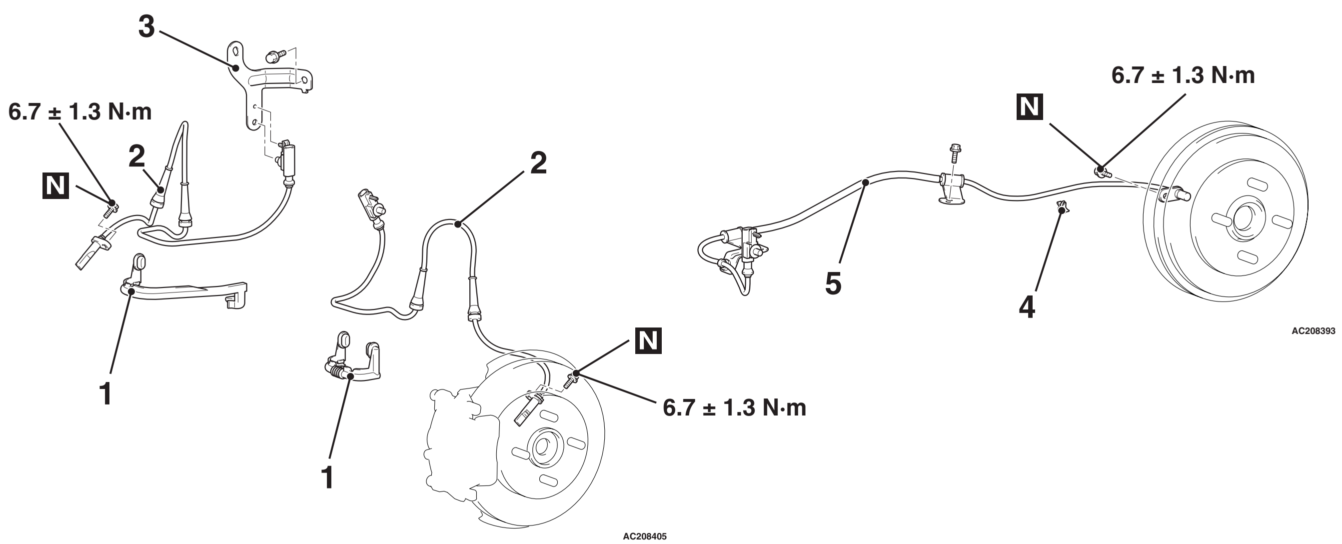
ABS SENSOR

REMOVAL AND INSTALLATION

M1352008300689

⚠ CAUTION

The vehicle speed detection encoder collects any metallic particle easily, because it is magnetised. Make sure that the encoder should not collect any metallic particle. Check that there is not any trouble prior to reassembling it.



Front wheel speed sensor removal steps

>>**A**<< 1. Front wheel speed sensor heat protector
2. Front wheel speed sensor
3. Front wheel speed sensor bracket

Rear wheel speed sensor removal steps

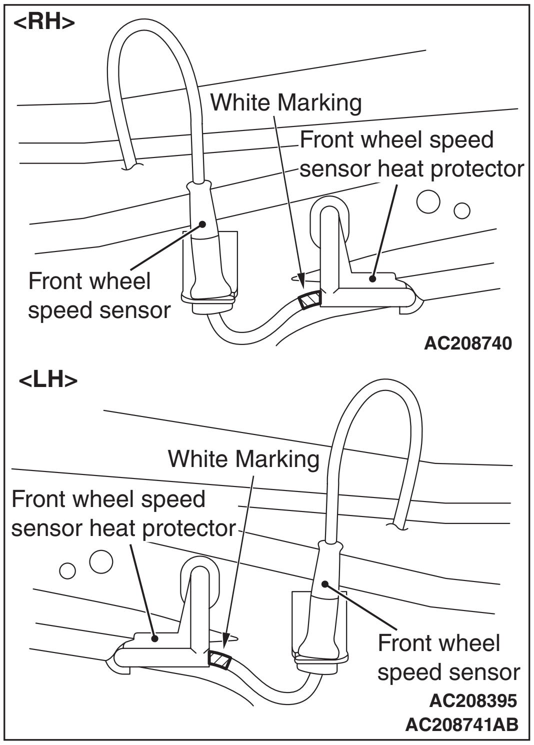
4. Clip
5. Rear wheel speed sensor

NOTE:
- *The encoder for detecting front wheel speed is a non-disassemble part integrated with the wheel bearing.*
- *The encoder for detecting rear wheel speed is a non-disassemble part press fitted to the rear hub inner ring.*

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INSTALLATION SERVICE POINT

>>A<< FRONT WHEEL SPEED SENSOR HEAT PROTECTOR INSTALLATION



Align the end of the white marking of the front wheel speed sensor with the edge of the front wheel speed sensor heat protector as shown in the figure.

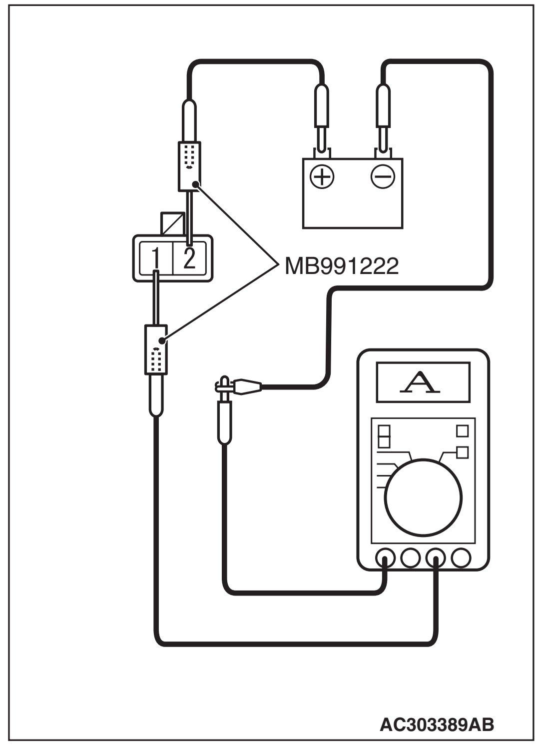
INSPECTION

M1352008400534

CURRENT INSPECTION OF WHEEL SPEED SENSOR

⚠ CAUTION

To prevent the wheel speed sensor damage, verify that the battery terminals are normal.

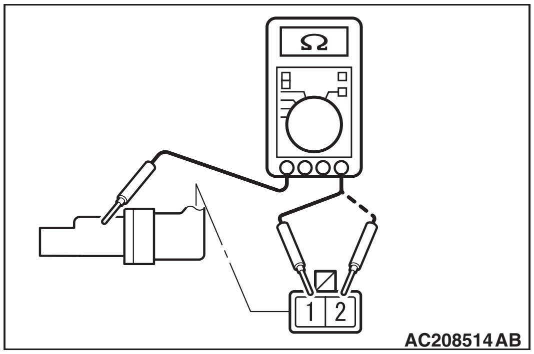


1. Connect the circuit tester to the wheel speed sensor using the probe (special tool MB991222), and measure the sensor current as a single unit.

   Standard value: 5.9 - 8.4mA

2. If not within the specification, replace the wheel speed sensor with a new one.

INSULATION INSPECTION OF WHEEL SPEED SENSOR



1. Measure the insulation resistance of the wheel speed sensor between the terminals No.1/No.2 and wheel speed sensor body as a single unit.

   Standard value: 5 - 100 MΩ

2. If not within the specification, replace the wheel speed sensor with a new one.